

GunDigest BOOK OF

LONG-RANGE SHOOTING

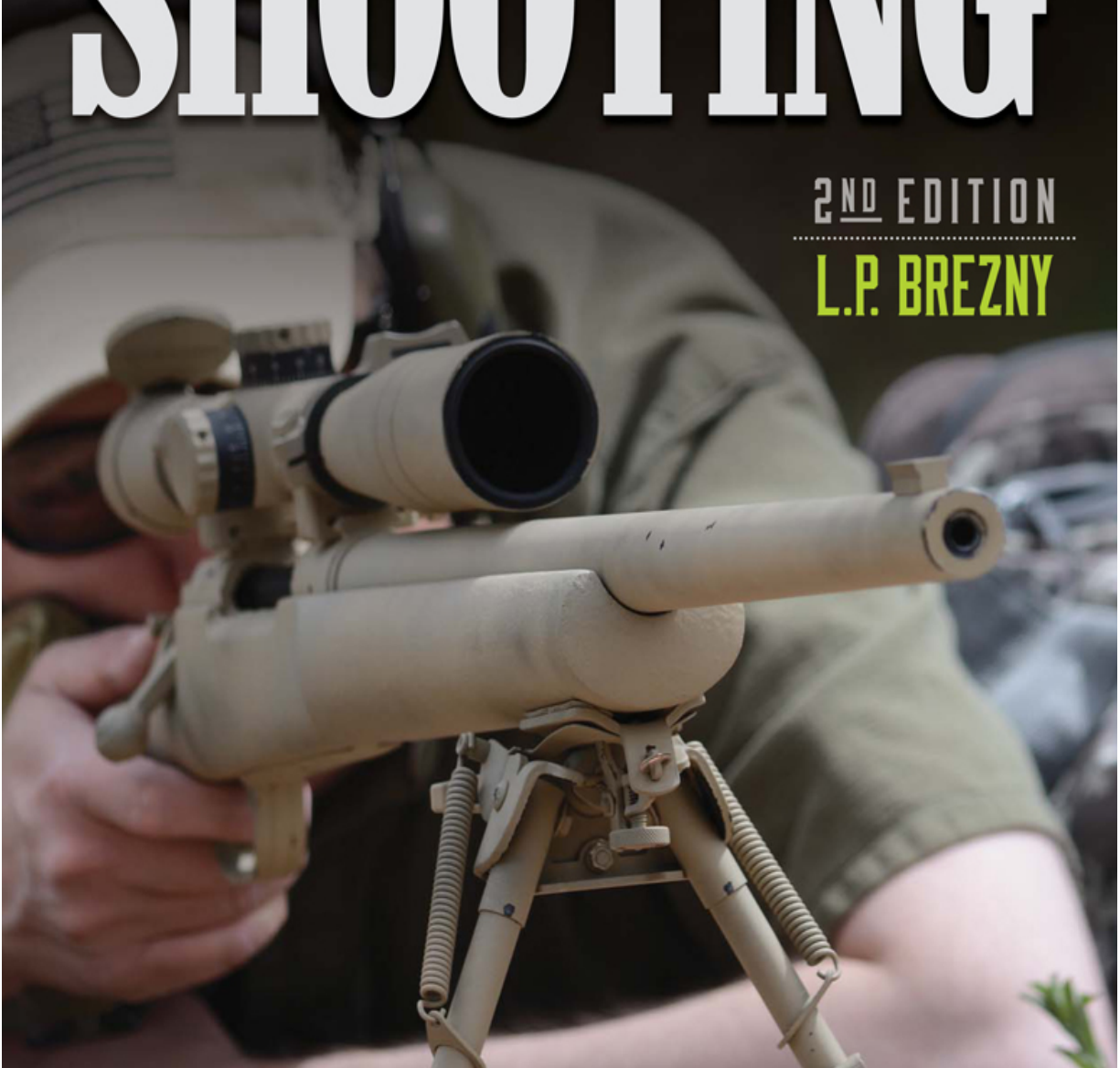
2ND EDITION

L.P. BREZNY

GunDigest BOOK OF
LONG-RANGE
SHOOTING

2ND EDITION

L.P. BREZNY



**GunDigest BOOK OF
LONG-RANGE
SHOOTING**

**2ND EDITION
L.P. BREZNY**

Thank you for purchasing this *Gun Digest* eBook.

Sign up for our newsletter and receive special offers, access to free content, and information on the latest new releases and must-have firearms resources! Plus, receive a coupon code to use on your first purchase from GundigestStore.com for signing up.

Sign Up Here

or visit us online to sign up at
<http://gundigest.com/ebook-promo>

DEDICATION

At a time when so much has been offered up by a very few courageous young men for this country, I have decided to dedicate this book to them. From the over-watch gun positions in Afghanistan and Iraq, to the rooftop surveillance and long into the night sharpshooter hides taken up by law enforcement officers across this country, we all sleep much better knowing that someone is watching out for our well-being 24/7. It has been through the extreme efforts of these warriors and lawmen that far more effective tools and skills have been developed in making that first shot a success by all of us who take up the task of shooting rifles at very long range. Thank you for your service.

INTRODUCTION

It's been seven years since the first edition publishing of *Gun Digest Long-Range Shooting*. In that time period, we as a nation have been on a constant war footing, one that has brought some major shifts in the way many shooters look at shooting sports, military applications, and police needs in long-range firearms. With the ultra-modern age of the advanced military sniper, special government sharpshooters such as animal control officers, commercial and public varmint hunting, open country shooters, and paper punching competition shooters, long-range shooting has been on the move toward major change. Rifles have advanced significantly, their optics are many steps further up the design ladder than even a few years ago, and ammunition won't slow down these days for anyone.



A modern TAC CZ turn-bolt in .22-250.

Where my first book centered on the idea that starting with some old-school basics can get interested shooters into the long-range game, this second edition will contain material that deals with today and what contemporary shooters need to realize if they want to make those first-shot, one-shot hits each and every time.

Today, new firing range operations all across the country are being built that are taking into account the need for extended range services. Sports from the classic long-range High Power matches to the current phenomenon of 3-Gun events require the element of range extension in their steel target and paper punching games. The shooting public in general also seems to be enamored with the idea of a military sniper sitting on a ridgeline in some foreign place, adjusting his sights for a shot at a bad guy on the next mountainside nearly a mile away, and, so, the hobby shooter is exploring

new ground, new targets, and new distances to shoot across. The snipers that inspire those greater shooting skills have changed, too. No longer are so many the get-it-done, lone-wolf specialist they used to be. Today's professional sharpshooter is more likely to be a team player working with and through speciality units designed to over watch combat situations and serving as a protective shield for their buddies fighting a ground war around them. These sports, professions, and ideas have greatly changed the face of long-range shooting in just these few years since the first book.



Kimber's 8400 Advanced Tactical. The author's is good for long-range work and is a .300 Win. Mag.

In examining all that's evolved in the last five years, this second generation of *Long-Range Shooting* will cover the most advanced rifles, the many specialized long-range cartridges being employed, and the other intricacies that can make a shooting system come together. Interviews with snipers, as well as discussions with the folks who build guns and ammunition and teach about and design the special gear for long-range

shooting will also come to the forefront of this discussion. In fact, I believe there's so much useful information in the pages ahead, I'd say that if you're not on the road to becoming a better shot after reading this book, then you just weren't paying attention.



Building an at-home range on a South Dakota ranch. To the left, the author's regular shooting partner, Tom Hanson, and Tom's nephew Cody (at right) set a backstop plate in place on a long-range steel target.



The author at the shooting bench with a T/C sniper rifle in .308 Win. (7.62mm NATO). The rifle is topped with a Burris Eliminator Laser Scope that works beautifully to 600 yards.

TABLE OF CONTENTS

CHAPTER 1: The Foundations of Long-Range Shooting: An Overview

CHAPTER 2: Cartridge Considerations

CHAPTER 3: Rifle Basics

CHAPTER 4: Heavy Hitters: The New Crop

CHAPTER 5: The Black Gun Equation

CHAPTER 6: The Super Bores

CHAPTER 7: Detailing Your Rifle for Distance Work

CHAPTER 8: Optics that Go Far

CHAPTER 9: Rangefinding Essentials

CHAPTER 10: Best Handloading Practices

CHAPTER 11: Chronographing for Accuracy

CHAPTER 12: Props & Techniques

CHAPTER 13: Where Can I Shoot Beyond 100 Yards?

CHAPTER 14: The New Long-Range Game in Town: Rifle Golf

CHAPTER 15: Professional Grade

AFTERWORD

Copyright

CHAPTER 1

THE FOUNDATIONS OF LONG-RANGE SHOOTING: AN OVERVIEW

IT WAS 1964, WHEN the box arrived from the NRA DCM program. That was a program that allowed members of the NRA to buy up military surplus rifles for as little as a \$10 bill. My brand-new, soaked-in-grease Springfield that had been manufactured in the Remington Arms plant, in 1944, had arrived. The rifle was the Springfield 30-06/03 series two-groover. That meant it had been manufactured using a less costly and less time-consuming two-groove rifling system, something that had actually been found to produce good accuracy—well, at least in terms of hunting the enemy during WWII. These Springfield's had been turned into effective sniper rifles for the task of reaching long-range pillbox targets in the island wars of the Pacific, or taking on a German bell tower artillery spotter in a small French town on the other side of the world.

Stripping the military stock, turning back the bolt handle, and removing the iron sights was a start toward this rifle's life as a reworked centerfire long-range rifle. With the help of the Herter's company, a stock blank with enough wood to allow me to carve a wide, beavertail fore-end was purchased out of the original Waseka, Minnesota, store's budget box. A

pound of fiberglass bedding compound, sling studs, and a recoil pad finished off the project.



The author on the bench with a newer Kimber rifle in .300 Win. Mag. It is just one of many rifles making the grade today with the long-range crowd.

Without really knowing it at the time, that heavyweight .30-06 shooter was my gateway introduction to the art of long-range shooting. After a month's work at the basement workbench, I had the makings of a first-class heavy target rifle. Almost done, I took an old, steel-tubed Weaver 10X fixed-power scope and mounted it in Weaver bases and rings. Next, I took a set of .30-06 dies for my Lyman turret press, added some Sierra 150-grain bullets (proceeded, in their lineage, by the current MatchKings), to top off

some military surplus 4350 powder at 61 grains in GI cases, and I was off to learn the fine art of sending bullets toward long-range crows, woodchucks, badgers, and other critters in the random varmint department.

My handloads produced a bullet drop at 300 yards of 6.8 inches, allowing me to keep “hair on target” well out to 350 yards, when fox or other, larger critters were in the crosshairs. Even shots to 400 yards were quite often possible, because of the quality Sierra boat-tail bullets and the good weight balance between the .30-caliber rifle and its match Springfield barrel. This home-built rifle held accuracy to minute of angle (MOA) at 100 yards. While this was not up to today’s group size standards, it was a pretty good shooting stick for a budget-minded young guy who liked to hunt, but was still trying to get through the University of Minnesota, pay the bills, and start a teaching career.

Like I said, that was 1964, now 50 years ago, if you didn’t want to do the math. Today, you will find that most modern rifles shoot to 250 yards or more with positive accuracy. That means the rifle will hold its groups to at least one inch at 100 yards (MOA). Even many a common deer rifle sold in the \$500 price range today will hold tight groups to that range with ease.

How is this so? In large part, better barrel steel, laser-guided cutting methods, and modern milling processes can turn out accurately milled actions well beyond anything known even as recently as a decade years ago. The average rifle trigger today compared to the reworked trigger assemblies used when I started in the business are a far cry from those early, slack-filled, two-stage firing pin let-off systems. Really, nothing about the modern centerfire rifle, be it a common deer rifle or a long-range varmint/target rig, is even close to those rifles we started with way back in the 1950s and ’60s. And the best thing of all, with the advanced design and manufacturing methods associated with modern rifles today, for the most part, the shooter

who wants to get into long-range rifles will not have to invest his life savings.

RIFLES FOR LONG-RANGE WORK

Rifles for long-range shooting are different from those used by the walking varmint hunter, elk hunters covering rough mountain country, and stump-sitting woodland whitetail shooters. The long-range rifle is generally a bit heavier than its thin-barreled, “pencil-piped” cousin, mounts a stock that won’t warp or twist with humidity or rough field use, carries a well-designed and tuned trigger, and retains a bedding system for the action that makes use of milled aircraft aluminum or glass. The barrels of these rifles are “twist-tuned,” meaning the rate of rifling twist down every inch of the barrel is matched to specific bullet weights, and the actions are better tuned (at least to some degree), to hold the cartridge case in alignment with the rifle’s chamber. These are key points in gaining good accuracy from a rifle, and, today, a plethora of over-the-counter rifles in their factory boxes, untouched and uncustomized, can produce some outstanding accuracy of a degree not often seen in those early years of long-range rifle production.



The author and a buddy glassing across a Minnesota swamp for crow targets, in the spring of 1972. The rifle is an author-rebuilt military .30-06 Springfield. These were very common conversions, after WWII, among hunters and shooters in general.



The author shooting coyotes with the new Remington Light Varmint (LV) in .223 Remington. Even this light, short-pipe rifle is quite capable of taking prairie dogs to over 500 yards, with dead air and a good ranging system.

As an example of just what even a very standard out-of-the-box rifle—one *not* specifically designed for long-range work—can do when married even to a lightweight cartridge, a hunt that made use of the .223 Remington LV comes to mind. This rifle, described by Remington as a Light Varmint (LV) model, mounts a fluted stainless steel barrel, a short-stroke 700 pillar bedded action, and a scaled-down synthetic varmint stock. It is drilled and tapped for mounting a scope (no iron sights).

Hunting in Colorado, well west of Denver and the Front Range of the Rockies, I was paired up with a group of scope manufacturers and bullet makers, all of us sitting hip deep in prairie dogs or, as I call them, “grass rats.” Using a heavy but portable benchrest that featured a fully adjustable fore-end rest with sand bags, I set up the light rifle for shots across a wide valley. Rick Payne, a Pentax optics sales supervisor, was acting as my spotter and ranging helper. Rick was well versed in the business of taking long-range pokes at grass rats and, as such, came back quickly with an exacting range of 587 yards to my first target.

What I’m not about to tell you is that I simply adjusted my sights and plunked off the fur ball on the far ridge. No, this was an exercise in artillery school shooting. As I shot several rounds, Rick spotted my impact points and returned information so that I could make the required sight adjustments and walk in the bullets to the unsuspecting critter. Start to finish it took three tries. With the third round downrange, a Hornady V-Max 55-grain pill, the prairie dog rolled off the mound, a small cloud of dust echoing the bullet impact.



Rick Payne of Pentax Optics gets behind a Browning A-Bolt medium weight varmint rifle and Pentax varmint scope in .243 WSSM. Rick is shooting 600 yard dogs, and note the spotter directly behind him calling the shots against a far hillside.

To get to that third shot, I had adjusted my Pentax target scope to the second Mil dot and pushed about a dog's body width away to the right of the animal. There was a slight crosswind of about five to seven miles an hour, and with that wind coupled with the high elevation and warm air, I knew my little .223 Remington load had more going for it up there than what would normally have been the case at sea level. Anyway, once I was there I was set. With the first kill confirmed by Rick, I simply moved to the right and promptly dusted off two rats back-to-back, not with the artillery school tries of the first, but rather with one-shot, dead-on hits.

In reality, the little lightweight, lower-tech "walking" rifle was taking on work designed for much heavier guns with much bigger cartridges. For the most part, the .223 Remington is designed for work to about 300 yards.

However, in the hands of a shooter who knows the cartridge, or by way of a good second man spotter, this little varmint/military round can be pushed far.

Of course, not everyone wants to push a rifle into work it's not really made for. For them, specialized rifles paired with cartridges for long-range shooting are available as both over-the-counter, factory-built guns or as customized offerings. Really, you have a buyer's market out there, if you want to get into a dedicated long-range shooting rig.

Remington is just about king of the hill, when it comes to factory-packaged, long-range critter-control rigs. I shoot a pair of Model 700 Varmint Synthetic (VS) rifles. The first is in .22-250 Remington, while the second is chambered in .243 Winchester. These rifles are exactly the same, save for the caliber difference. They both use HS Precision varmint/target stocks that retain aluminum pillar bedding, have medium-weight varmint barrels, and good, crisp, gunsmith-tuned 2 $\frac{3}{4}$ -pound triggers. Both rifles mount Redfield bases and rings, one with a Weaver 4-16x, the other a Simmons 4.5-14x tubes, with sniper Mil dot elevation and windage correction indicators. Accuracy with both rifles is sub-MOA at 100 yards, with good handloads punching one rough hole in the paper.

Remington offers the Model 700 Sendero SF in the heavy .300 Winchester Magnum cartridge, which is very popular with our military snipers doing long-range work in Afghanistan and Iraq. This rifle is also offered in 7mm Remington Magnum and 7mm Remington Ultra Magnum. Move off that mark a bit and the Remington Model 700 VSF (Varmint Synthetic Fluted) can be obtained in the 7.62x51mm NATO (.308 Winchester) cartridge. It doesn't stop there. According to its website, Remington now has more than a dozen centerfire rifles dedicated to varmint and tactical long-range use, everything from the rather plain-Jane but highly

accurate 700 SPS Tactical on up to the highly specialized SPS Tactical AAC-SD (designed to be used with an AAC or similarly threaded suppressor), and the super souped-up 700 Tactical Chassis.

Of course, Remington isn't the only maker of long-range rifles. Take, for instance, Ruger's Hawkeye Varmint Target Rifle. In cartridges ranging from .204 Ruger and .308 Win. to the increasingly popular 6.5 Creedmoor, Ruger's VTR includes a very nice two-stage trigger that has a crisp let-off. This rifle also has a barrel that is stainless steel, hammer forged, and target crowned. Add the laminated wood stock and you have an accurate shooting platform for sending long-range pills across fields of prairie dogs or incoming coyotes.



Remington's 700 VTR, the most recent upgrade from Big Green.



Ruger's Hawkeye Varmint Target rifle replaced the old heavy-barreled M77 models. Right: Ruger continues to make its lovely single-shot No. 1 in a heavy-barrel varmint version.

I entered the long-range club via the Varmint Hunters Association years ago by way of a Ruger MK II chambered in .25-06 Remington. Shooting a handloaded 87-grain Speer TNT, I dusted off a grass rat at 527 yards with my first shot. (The .25-06 Remington is a real favorite of mine, and there will be more coming on that hot long-range cartridge a bit later.) From the .22-250 Remington, .220 Swift, and .25-06 Remington through the .308 Winchester, this rifle can cover all the bases with the exception of the ultra long-range powerhouse offerings. In other words, if you want a solid 600-yard shooter or more, Ruger can get it done with the best of them.

Another excellent rifle on my list, and by no means the last, is the Savage Arms Model 12 Varmint. Here again, value for the dollar is right up front. Savage has designed accurate rifles that won't kill the budget. These rifles use the AccuTrigger, which can be adjusted from 1½ to three pounds in complete safety. The system uses a double release shoe that is failsafe, in terms of an unintentional discharge.

Savage's Model 12 VLP DPM will chamber the heavy long-range cartridges such as the .300 WSM and the .308. Move to still other hard-hitting rounds and a half-dozen variations in the Target Rifle Series, and you can choose from 6 Norma BR or .308 in something like the Bench Rest model, the 6.5 Creedmoor in the Long Range Precision variant, or the .308 Palma in the Palma model. These are some serious long-distance firearms. Savage is known to build some of the most accurate and modestly priced rifles on the market today. I have suggested these rifles to many beginning varmint/long-range shooters, with some very pleased shooters coming to the forefront after they give these rifles a try.

I could go on and on with brand names of relatively affordable, out-of-the-box rifles, but the fact is that today it is a buyer's market out there and the competition for your business in the big rifle department seems to have no upper limit. Just a quick glance at the sheer number of rifles dedicated to varmint and long-range use on almost any big-name website will tell you that. Your biggest chore will be wading through all that's out there and picking the one that suits your needs best.



Today's AR-platform is making all sorts of splash with long-range fanatics. They sure aren't your granddaddy's rifles.



A custom bolt-action ready for long-range work.



Handloads can make the difference in a great long-range shooter, as well as an average job. More shooting for less money is the rule, and those loads can be very dependable.



From the .223 Remington to .25-06 Remington, the handload can stretch range – and a dollar as well.



The .50 BMG (left) and .218 Bee (right). The first cartridge rules the long-range game.



Think long-range is just about a few specialty rounds and guns? Think again, there's piles of choices available.

WHAT CARTRIDGE SHOULD I CHOOSE?

There's an entire chapter ahead on cartridges and how they work, but let's cover some basics here. Between the old and proven standbys and the hot new kids on the block, today's long-range shooter has nearly as many cartridges to choose from as they do guns. Not all are created equal; some really only shine in a limited range of applications. Too, some cartridges are best left on the dealer's shelf.

Assuming you have decided on a rifle model designed for long-range shooting, the next step is selecting a cartridge for that new shooting stick. Here there are some things that need to be addressed in making that decision.

First off, looking at a list of possible cartridges, you will see huge differences between them. This includes recoil levels, price per round, basic working range applications, and even specific rifle types.

Second, you're not likely to find factory rifles chambered in some of the exotics. Buying a 6mm-284 over the counter or one in 7.82 Warbird is highly unlikely. Such rounds are mostly proprietary propositions, and that means custom rifles.

Understand that the first rule in selecting a cartridge for long-range shooting is that more power and powder are required to get the job done. That means the big cartridges, such as the .300 Winchester Magnum or the 6mm-284 that is, of late, so popular, will push more bullet further with less drop at longer ranges. Take the .300 Winchester Magnum, for example. This .338 Winchester-based cartridge uses a .30-caliber bullet and is, without question, the most popular super long-range .30-caliber of all time. Army snipers like it, as do law enforcement units needing a tool that effectively punches out to tough targets. For the long-range sport shooter, the .300 Winchester Magnum is also king, because it can send heavy Very Low Drag (VLD) bullets to 1,000 yards against warm targets and still accurately hit the vitals.

At the same time that you need more powder and bullet to shoot effectively at distance, you don't want to overdo the recoil (nor overestimate your tolerance level for it). Shoot too much cartridge and you won't shoot well—at all. Using the same .300 Winchester Magnum as an example, a sensitive shooter can quickly develop a flinch.

Another thing to take into consideration is that big, high-power, long-range rifle shooting almost always requires a spotter at your side while you're shooting. Recoil levels are so high that the target becomes a blurred-out image upon cartridge ignition. (Well, unless the target is so far away

that the rifle and scope have time to settle down prior to the bullet's impact. Believe me, that won't happen very often, if ever.) Do you have a partner you can work with regularly? If not, you're going to spend a lot of time walking or driving back and forth from bench to berm.

What you need to do is select a maximum distance that works best in terms of a cartridge choice and generated recoil levels, then go to work learning everything you can about the performance of that given cartridge. Still too much to sort through? Try this. As long as I have been shooting long-range targets, I've tended to like cartridges like the .243 Winchester, .243 WSSM (Winchester Super Short Magnum), the never-to-be-discarded .25-06 Remington (the best of the wildcats to go commercial), and the workhorse .308 Winchester. Learn any one of these cartridges well and you will do some serious damage to some very long-range targets. They will send bullets to long ranges and do so without the massive recoil that can cause shooter fatigue. If you must have more, on the high-recoil and -energy end of things, I do shoot the 7mm Remington Magnum in a Ruger No. 1, as well as a .50 BMG upon occasion, but with far less frequency than other rifle/cartridge choices—the reasons should be obvious.

The final rule about cartridge choice is to stay within your means. By moving to some exotic caliber in a full custom rifle, you're going to have to pay a good deal more per round (and that after the high cost of the rifle), sent downrange in every case. You can shoot a whole lot more .22-250 or .25-06 than you can 6mm-284 or even a .300 Winchester Magnum for a given amount of money.



The author at the benchrest with his Remington varmint rifle (VS) chambered in .22-250 Remington. This rifle is a closer match to the military M-24 sniper rifle in current use today.



Brezny with a rockchuck taken with his Remington VS in .22-250 Remington. Note the ranging card attached to the fore-end. These help a great deal, when correcting holdover at long ranges.

HANDLOADS ARE REQUIRED

Except for shooting a factory .223 Remington, for which you can find ammo almost anyplace nowadays, most long-range cartridges are going to require you to handload, if for no other reason than to be able to shoot more often for less money. But, just so you know, when you begin handloading, you will find yourself plummeted into an endless learning curve (or so it at least seems that way). Building your own loads will produce an understanding of basic ballistics: bullet drop, velocity loss at different ranges, what powders will produce the best loads in your individual rifle, etc. But it's worth getting it down, because handloaders always have an edge in the field. Yes, new factory loads today are indeed a far cry from what was available in my early days of rifle shooting, but you can *always* tinker with a handload and pull a few hundredths of an inch off that group size. Certainly you can save some hard-earned money over those factory loads. Just by having the spent brass to work with you're saving, and you can surely shoot for half or one-third the price of factory-rolled ammo, when it comes to the bigger, more expensive cartridges.

When I buy a new rifle, I run a series of handloads through it after a break-in period with factory ammo. What I'm searching for is that special sweet spot in powder charge, bullet weight and design, and even, in some cases, primer brand. When that hotly accurate load is created, my new rifle will shave off a quarter-inch or more from its group size discovered during the break-in round. Truly, you should be able to cut groups to under a half-inch at 100 yards by handloading. If your rifle sends a bullet to exactly one-half of an inch at 100 yards, that same group will be 1½ inches at 300 yards, two inches at 400 yards, and 2½ inches at 500 yards. That 500-yard shot

can easily be a miss on a fat prairie dog, even without factoring in wind, temperature, altitude, and about a dozen other elements that can make you miss the shot.

The key to reloading for long-range accuracy is to not go wild. Start by deciding on a few well-tested and -researched loads. With a press, scale, powder measure, and a set of dies, you're in business to begin your experimentation. (Load tables appear in [Chapter 2](#).) I shop around for used dies that are in good shape; at gun shows I often find rifle presses at bargain prices. How long will all that loading equipment last? My Redding powder measure has been kicking out powder charges for better than 47 years to date, and my RCBS "C" frame press isn't far behind.

From the days of the buffalo rifles in .45-70 Winchester (our first long-range tools), to the heyday of the .30-06 Springfield, one thing is for sure and that is that rifle cartridges do fall by the side of the trail in favor of newer and better products. Take, for instance, the newer Winchester WSM series of wide-bodied short cartridges in .270 and .300 calibers, both of which quickly usurped the WSSM line of cartridges from Winchester. Overall, today's newer cartridges tend to burn powder more efficiently, reduce recoil levels even in lightweight rifles, and have been developing a good track record among big-game and varmint hunters in the field.

Bullet designs are also always being researched and improved upon. I worked on several new bullet types and charges for magazine articles in 2005. During that time, I found that VLD (Very Low Drag) bullets did improve group size and reduce drop figures. When VLD-classified bullets are designed, they are manufactured to make maximum use of boat-tail bases, long, smooth nose cones, and a good ballistic coefficient (BC).

As most of you know (or should know), BC is the factored number assigned to a bullet that will demonstrate how efficient it will be as it flies.

The higher the BC, the better that bullet will perform, at least most of the time. There are problems with this system in that, at very low velocity, the BC calculation dies a quick death. Also, as the same bullet is fired in different rifles and cartridges and at various velocities, its BC number will change. Add high altitude and other atmospheric conditions and, again the BC numbers all roll out differently. That said, the best way to determine a bullet's performance profile in real time, of course, is to shoot it.

THEY CAME, THEY LEFT

With six or seven years burned off the calendar since the first edition of this book, it's become clear that the super-short cartridges that were the hot new items back then have not been widely accepted. Why? My thought has been simply that too many different new cartridges came out at exactly the same time. The average rifleman was overwhelmed by all the data and the sheer number of products. Therefore, only a limited amount of material stuck on the wall. Be that as it may, ballistics still tell the tale. In terms of bullet performance the WSSM series of Winchester loads match closely the high-performance cartridges they center around, the original .223-, .243-, and .25-caliber rounds, though the WSSM's were offered in longer fuel cells. I even bought into the trend at the time, turning to the robust .257 Weatherby Magnum for an upgrade about four years ago. It was a successful move on my part, and this round will be covered in another chapter, but, for the most part, the WSSM fad is dead and gone.

RESEARCHING YOUR LONG-RANGE RIFLE

Let's call him "Bill," because he would not want his real name printed here. Bill wanted to get into long-range varmint hunting and shoot with our gang that, to the man, shot the .22-250 Remington cartridge (though in a

varied lineup of rifle brands), as well as several other cartridges and rifles in a few larger fuel cell designs. Bill was determined to go about his new-found sport on his own, without discussing his choices with the rest of our group.

It was the spring of 1998. I had just retired from teaching and was researching building a home in western South Dakota. Bill wanted to join our group of shooters who had planned to head west out of the Minneapolis/Saint Paul area for a weekend of grass rat hunting near Rapid City, South Dakota. We had elected to start our shoot just across the Missouri River, at Cheyenne River, a large Lakota reservation on the western side of the state.

Now, Bill had brought along his new shooting iron and, obvious to all of us, was excited to get it into the field. His choice had been the Sako Hunter in .17 Remington. While I have nothing but high regard for Sako rifles in any caliber, the selection of a pencil-pipe walking rifle would not have been mine for the sport at hand. Shots on our scouted prairie dog towns almost always ran well out into the 400-yard range, and the little .17-caliber, 25-grain bullet, as good as it was, just didn't carry the mail that far.

A quick look in almost any ballistic table will show that the .17 Remington starts off like a rocket heading for the moon at 4,040 feet per second (fps), but, at 200 yards, it has degenerated to 2,644 fps. At 400 yards, it is all the way down to 1,606 fps. Compared to the .22-250 with a .22-caliber bullet in the 55-grain class, the difference at 400 yards is a 235-fps spread, with the 55-grain able to buck wind far better than the smaller 25-grain bullet; even though the exact 400-yard 17-inch drop is the same for both bullets, the energy that determines the bullet's ability to carry well in hot up/down drafts and crosswinds is a slumping 143 ft-lbs for the .17 Rem. versus a stable 410 ft-lbs for the .22-250.



Today's out-of-the-box rifle will outshoot any of the custom rifles of yesteryear.

If you want to drop a red fox by way of a fur buyer's cartridge, the .17 Remington is the way to go every time. However, ours was a trip shooting long-range prairie dogs, and the little .17 was going to be outclassed by the .22-250, not to mention a couple heavy target .243 Winchesters and .25-06 Remington pill throwers. We were convinced that Bill was headed for some disappointing gunning. Bill also had not considered the amount of cleaning supplies and time involved in keeping his sub-caliber up and shooting. The .17 needs a lot of cleaning rod time, as that super-small bore can get skunky fast, when hot powder residue starts to build up.

By the time we had finished the first morning of gunning, Bill understood there were far better choices in a long-range rifle and that, at best, his rifle was suited to medium-range work of the type more in line with the .223 Remington shooting 40-grain bullets. While it's true that the .17 Remington is a great little cartridge for many jobs, "long-range" extends only to about 300 yards—and what is long-range for one shooting system is only a starting base for another. For instance, my 7mm Remington Magnum with a

Sierra 100-grain Varminter hollowpoint bullet is just taking off at just about the point where the .17 Remington starts to die. Conversely, at the point where my 7mm Mag. dies out, the .50 BMG is hauling along with Mach II velocity pushing its 700-plus-grain projectile. The lesson here is that before you make the investment, taking the time to research the effectiveness of any long-range rifle and ammo combination is required.

CHAPTER 2

CARTRIDGE CONSIDERATIONS

SELECTING A RIFLE CARTRIDGE for long-range work is serious business and probably the first choice, even before you decide on a rifle to put it through. As you could see by way of our old friend Bill, in [Chapter One](#), if you make the wrong choice, the days in the field can get long. I have touched on some elements associated with cartridge choice already, but it's time for a deeper look at what goes into making your choice, as well as some of the premium choices available today.

CARTRIDGE SELECTION BASICS

If I'm going to talk about long-range rifles and cartridges, then it's important to define what is "long range." For me, there's a wide range of cartridges that are most accessible to the American shooter and meet the widest array of applications. These run the gamut from .22-calibers up to some in the .30-caliber range. That's what we're going to talk about here. The super-bores, those .33-caliber and up, will be covered in the chapter on the guns they go with, "The Super Bores."

Let's start at the small end of things. When it comes to rimfire and sub-caliber centerfire cartridges and the rifles that fire them, it's wise to never set aside this class as being somehow less than important to the discussion of long-range riflery. Rimfire rifles have served hunters, ranchers, and target-shooting sportsmen throughout the history of firearms ownership in

America. Indeed, when wars break out, selected snipers have often been farm kids and cowboys who were raised with .22 rimfires in their hands.



The rifle cartridge is the element that makes the system work. Poor ammo means poor ballistics and a missed target at long range.



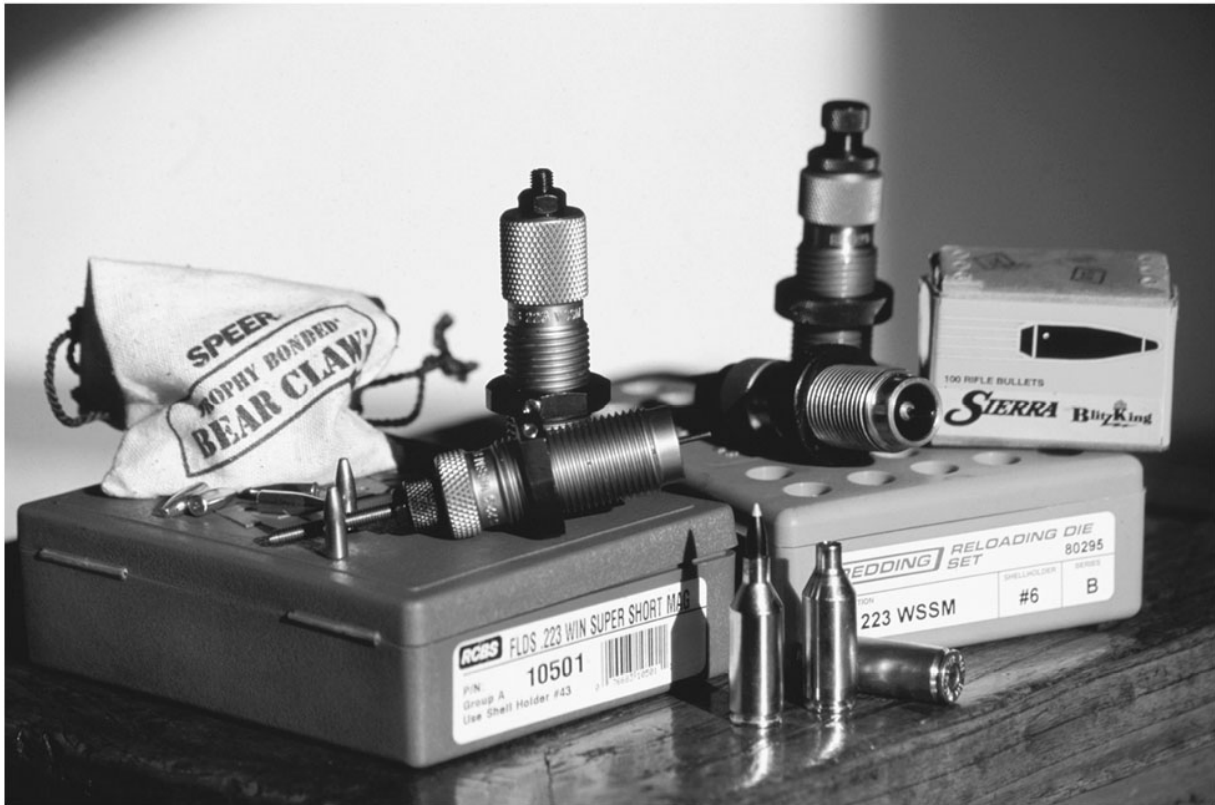
Bullet selection for big game and dedicated long-range shooting can be closely parallel. Using enough bullet for both tasks is critical, when range is pushed beyond the normal limits.

These cartridges can produce some outstanding results in the right shooter's hands. I have personally witnessed my local South Dakota shooters do some amazing things with a single-shot .22 rifle and a handful of cartridges, and I'm about to tell you about some of them, real-world examples of how sub-caliber rifles and cartridges can get the job done, and at distances farther than you might think. Now, am I about to tell you a .22 LR can be accurately shot to 1,000 yards? Of course not, but that's kind of the point; how you define "long range" is relative to the gun/cartridge in consideration. What I'm getting at is that, if we're going to talk about long-range rifle work, then we have to talk about just how far beyond *normal* effective ranges any combination can be pushed. This is especially

important, because it's not always best to turn to the most massive caliber you can find to send big bullets way downrange.

The first thing you need to define is what long-range is to *you*. Let's say you're living nearby an urban environment. Long-range shooting, in that case, might be under 400 yards nearly all the time. There, a cartridge such as the .223 Rem is a "get by" choice, though the .22-250 is often a better option, having some added edge in downrange energy and velocity. That edge can certainly be a plus if you take the occasional western United States varmint hunting trip, where the added energy velocity of the .22-250 Rem will come in handy for dog town shooting or incoming coyotes. Conversely, if your long-range is in regulated competition, where the extended targets run from 600 to even 1,000 yards, you're going to need something much more than a .223 or .22-250.

The next thing to consider in your cartridge choice is its recoil level. We have discussed flinch to some degree, but other problems with excessive recoil are the loss of target (blackout) and the subsequent readjustment of the sights to the target after the shot, as well as recoil fatigue in the field when gunning multiple targets at long range. Really, this is about the age-old problem of too much rifle. It is just possible that, say, by selecting the .308 Winchester or even .30-06 Springfield over the much bigger .300 Win. Mag., you will ultimately do a better job with a bit *less* cartridge.



Handloading will enable the rifleman to select very specialized loads that often can't be found in the sporting goods store.



Here's a mix of ammo that will all do a good job under the right conditions. Remember, the more bullet and more powder, the longer the extended range. Keep each cartridge working within its proper limits.

About two years ago, I was hunting, in Colorado, with a group of prairie dog shooters, when a fellow pulled up in large Chevy Suburban. This rig was set up expressly for carrying everything the hunter needed to shoot long-range dogs with his custom-built set of 6mmx284s. This fellow had trays of handloaded rounds, tables of data relating to preset Mil Dot points that matched exact ranges beyond 400 yards, and a massive, swiveling benchrest complete with fore-end rest and sand bags that locked everything in place rock solid.

Chambering and firing those big 6mmx284 rounds caused the ridge around our party to shake, as his muzzle brake spat out gas and fire with each shot sent across a wide draw. He had set his sights on a dog lodge that contained a single large prairie dog and, when it was ranged to 630 yards,

he was determined to put a bullet in the right place. *Boom, boom, boom* the shooting went on, and yet the rat just hung around the mound as dirt was sent flying high above its head. The guy never did hit his target.

What had gone wrong, there, was that this dedicated shooter was shooting too much cartridge. It was obvious that he was becoming fatigued with each successive miss, and the shaking blast of that big cartridge was starting to get to him. Over the course of a full two hours, I never did see him hit that or any other dog on that far-off ridge. I'm quite confident that this rifleman would have been far better off with less.

Factoring in the cost of a single round of ammo today is also a major part of the equation, when selecting that chamber size. Since most long-range shooters are (or should be) handloaders, figuring the amount of powder a cartridge will eat up per shot, the price of bullets to top off the cartridge, and even the price of new or once-fired brass is imperative. This may seem like a small element at the sporting goods store, when selecting your cartridge and the rifle it goes with, but, when you get all that rifle home, the fun is just beginning, as is the reloading bill. I hope that 6mmx284 shooter was well-heeled, because the amount of brass that was hitting the ground had to add up to one pile of money.



A custom .22-250 by Jeff Rhyes, powered by Norma ammunition.

Recently, I helped a young fellow get a long-range rifle and, by using some common sense, his entire setup came out quite well. My friend had only one eye and, being forced to shoot left handed to accommodate that drawback, he elected to take on the Thompson/Center Encore chambered in .25-06, topping it with a Leupold VXIII 4.5-14x scope. He figured the .25-06 recoil levels were manageable in the light T/C rifle, plus reloading for this cartridge was a complete breeze, with components readily available and on the inexpensive side compared to many others.

Now, this friend was a hunter in Western South Dakota, a place of long shots, even if you're not necessarily searching for them. Antelope, deer, elk, and varmints don't give you much in the way of close-up-and-personal during a hunt, so the young fellow, being a native of the area, understood

the mentality of the Western rifle hunter very clearly. In the first season using his .25-06 creation, my buddy dusted off a nice mule deer at 385 yards, dropped several long coyotes at or near 400 yards, and shot some extra long-range prairie dogs to fill in the blanks. Average range with the light Encore, in most cases, was beyond 300 yards and, at times, almost out to 500 on the grass rats. Was his long-range choice a good one? Yes, and far better with much less cash outlay than the fellow with the big 6mm and his pile of recoil flinch.

Ask yourself what type of targets will you most likely be facing in the field. This, again, has a major bearing on which cartridge you select. If you're hunting prairie dogs almost all the time and working with good weather (meaning low wind conditions in easy rolling country), staying with the light .223-caliber cartridges is a good idea. However, taking on mountain rock chucks or marmot, big, open-country coyotes, or game animals at appropriate hunting ranges (more on this subject later), you may want to consider a bit more cartridge for the job. For such shooting, cartridge choices in the 6mm, .25-caliber, or .30-caliber families may fit your needs. Remember the rule I talked about in [Chapter 1](#): more powder and more bullet equals more distance downrange.

One final note about cartridge selection. Know that, when you move up in cartridge size, the rifle must be moved up in weight, too. If you think that's no big deal, try hauling a 14-pound cannon around a dog town on a hot South Dakota or Wyoming summer day. Even if you are willing to hump that gun over hill and dale, I'd bet a day's pay you're not going to shoot it very well when it comes down to doing just that.

SELECTING LONG-RANGE HUNTING BULLETS

Fur taker or pest controller, your choice in rifle bullets can make or break your field success at distance. Because some of you will handload for your long-range rifle work and some of you will stand by factory-rolled ammo, the question of caliber selection is only the first step in the understanding of what it takes to be a top performing long-range round. The bullet is the second half to that equation, in that it is at least as important as the overall cartridge itself. Let's look at an example.

The state of Oklahoma, in 1999, was a vast holding pen for thousands of coyotes. Pairing up with my partner in the business of 'yote hunting, Larry Symes, I had been given permission to call and clean out as many 'yotes as possible from a Texas/Oklahoma border ranch; Larry had locked down about 5,000 acres for a late winter hunt for song dogs. Now, amateurs don't scout and lock up that many sections of Oklahoma ranch land, if they're not dead serious about their craft. Larry was serious. In fact, though Larry is a horse dentist by trade and a coyote hunter by hobby, or at least that's the way he puts it, I know for a fact that Larry is one of the best coyote hunters in the country. Anyway, as a direct result of that acquisition of that vast ranch land, I was able to learn a great deal about rifle bullets and the way they behave against large, warm targets in the field.

In those days, hunting song dogs and red fox in Minnesota (where I lived at the time), would, over a long period of time, produce a lot of useful information about the net effects of various rifle bullets. However, hunting Oklahoma means a hunter can get off as many shots in a single morning as he may experience over a full season in the land of ice and snow. No matter how you cut it, the big country style of coyote hunting over vast expanses of land holding thousands of dogs will always produce a far better open-air classroom setting for the hunter. Read all the books you want, but hitting

the draws and ridgelines with a call and rifle is the real-world school of long-range rifle work.



Brezny's hunting partner Cory Lindbergh (Cody Hunts), searching for coyotes incoming to the call.



The late restaurateur Matt Martinez, a fellow coyote hunter and friend of the author's from Texas, decided to stay with a soft shooter, and here elects to work with a Savage 110 in .223 Remington. It got the job done for Matt, and that's what counts in the end.

Hunting that Texas border ranch, Larry and I hit upon a pack of calf-killing coyotes that seemed to be headed up by a huge "coy-dog," what we

call a half-coyote and half-domestic dog. This makes for a real livestock killer, because the coyote part of the critter is the natural hunter, but the domestic dog in the animal knows man and how to work around him. After hunting the better part of four hours, we were rounding a bend in the road as it fell away toward some bottomland grazing a small herd of cows with calves. All at once, from the far side of the draw, we both spotted a pack of coyotes headed up by that big, gray, half-breed coy-dog, now moving away fast at the sight of our pickup truck. Crossing the pastured bottom, we bailed out of the truck and headed at a dead run up a slope and into some heavy buck brush. Larry motioned for me to move to the right, as he headed farther uphill into the thick cover. I have to say, the situation was a little nerve-wracking—I wasn't at all impressed by the fact that we were giving chase to a coy-dog that didn't give a rip if he tore into us full tilt. Since I didn't have enough of an opening in the brush to get off any kind of measured shot, I would have just about given up my soul to the devil for a short-barreled scattergun and some buckshot.

Just as I was worrying about my hide, I became clearly aware of a growling and snarling coyote heading directly for Larry. With my rifle at the shoulder position, I tried to search for any kind of clear path in the cover, so I could aid my friend. But, no sooner had the thought crossed my mind, when Larry turned loose a round from his .22-250 Rem. heavy varmint rifle. At the shot, a large coyote busted through brush, moving across my path. I searched frantically for even a small opening that would allow me to bust a cap on my .223 Remington. Finally, a spot opened and, at the shot, the big dog rolled up tight and came to a stop in a heap of fur, most of his chest cavity unglued. Larry's bullet had found its mark, but he had been test-shooting a new bullet design that was far too light in construction for heavy varmints. As a direct result, it had only produced a

massive flesh wound dead center on the animal's chest. I, on the other hand, had chambered a bullet that was lighter in weight than Larry's, but one that had been designed to hang together before blowing up after reaching the vitals of the big, raw-boned critter. Nothing against Larry, but his .22-250 bullet just hadn't done its job, whereas my much smaller .223 bullet dropped the critter quickly and cleanly.

Today, different bullet designs are as common as houseflies, but they all work a bit differently, depending on the size and density of the varmint being hunted. Therefore, getting to the basics of what you need in varmint bullets is the direction I'm about to take this discussion.

Selecting bullets for handloading (or when appraising factory-rolled fodder for your rifle), can be a simple thing, if you observe several rules. First, try to stay with lighter weight bullets for smaller cartridges in the varmint-class loads. If you're shooting a .22 Hornet, for example, it would be wise to consider ammunition from the reloading bench or store shelf that makes use of a 40- to 45-grain bullet. Heavier bullets will work, but, due to the velocity limitations of the smaller cartridge, you should expect less effective expansion from thicker-jacketed and heavier bullets. Starting to see what I'm getting at?



Larry takes a break after dusting this Oklahoma coyote with his custom .22-250.



When bullets work, everything else works out just fine.



Charlie Sisk of Sisk Rifles, in Dayton, Texas, with his Leupold-scoped full custom varmint rig in .22-250 Remington.

Turning to the .222 or .223 Remington, a move up in cartridge energy and velocity has been attained over the smaller rounds and the use of heavier pills can now be in order. Here, the 50-grain bullet is a popular choice, because it is fast-moving in the smaller cartridge case, but still can produce clean and effective kills given the proper bullet design.

In the final group of .22-caliber varmint pills, we turn to the .22-250 Remington. Here the 55-grain bullet is king, because it can be pushed very fast from this larger-cased cartridge. Of course, you can move up into the .220 Swift and retain the same bullet weight as the suggested bullet in the .22-250, but the Swift's muzzle velocity of 4,000 fps will take its toll on a rifle's barrel over time. This is why the .22-250 Remington has outstripped the large Swift today as the cartridge of choice for most varmint hunters searching out that ultra high-velocity, long-range rifle/cartridge combination.

When it comes to bullet design, today, more than at any time previously, we are seeing a more and more innovations that are making them more effective projectiles. By streamlining bullet shapes and using everything from polymer-tipped pills or special jacket expansion designs, varmint bullets run the spectrum from reacting like bombs on impact on to the other side where they push almost straight through, causing plenty of internal damage but little in the way of pelt loss. If you hunt for fur, you want a bullet that will penetrate deeply, then blow up and not leave an exit hole—"one-hole pelts" I call them—and that's the way the fur buyer likes it.

So what's the right bullet choice for *your* job? For the most part, the new poly-tipped or plastic-point bullets are much alike and will drive deep into a soft target and then explode. Small critters, as in prairie dogs, will literally

come apart. Take that same bullet, and foxes and coyotes will take the shock and roll dead in the dust, but their hides will remain intact if hit at ranges beyond, say, 100 yards. As any bullet reaches a target at a closer point, the energy is going to be compounded and more damage will result. Take Larry's bullet on that coy-dog, for example. If he had hit that critter at 150 through to 250 yards and not the 50-yard point-blank shot he was offered, that bullet most likely would have penetrated deeply and then come apart. Being a light, jacketed hollowpoint design, at close range, it simply rolled over and flew to pieces on the coyote's hide.



A CZ 527 Heavy Varmint rifle.

Are new bullets coming down the line for varmint hunting? According to my quick count, we now have well more than 50 factory variations offered by the big four (Winchester, Remington, Federal, and Hornady), as well as more than 100 bullets in the centerfire varmint rifle class for hand-loading. These home-rolling bullets are offered up by Hornady, Speer, Nosler,

Sierra, and Winchester. Hornady alone offers nearly 50 different bullet types that could be applied to varmint-class targets. The modern poly-tipped bullets offered by the major handloading component manufacturers are among the best in high-tech bullet development, and younger companies such as Environ-Metal, Inc., the makers of Hevi-Shot waterfowl ammo (non-toxic), are designing bullets that make use of a pure tungsten dust core. Truly, bullet designs and types are just about infinite.

The thing to do here is to pay attention to just what your selected bullet is doing on contact with targets. If critters are running off after being hit, it is possible that your bullet is not getting the job done. With all the current choices in bullet designs, there's no excuse for using the wrong bullet for the job at hand. The long-range rifleman wants a clean-killing bullet, as well as one with good retained velocity, low drag, and accuracy. A tall order there, but it's some of the stuff that makes "stretch shooting" a whole lot of fun in addition to its inherent challenge.

AVAILABILITY

When it comes to cartridges and bullets for the hunt, the subject of availability is paramount. If you can't find components, you're in trouble from the start. Take on some oddball wildcat round you've got to feed with some hard-to-find brass, or a bullet of an odd size, and you're heading up the road of hard times, my friend. Keep in mind where you live, what's available locally to you and/or how much it will cost to ship in products from establishments that handle reloading components. Also, keep in mind the amount of case sizing involved in a round: Will it be necessary to obtain custom-made dies? Will you need a set of dies that works brass in stages, versus a single run-through (as in the .243 Win sized from a .308 Win. case, or the .25-06 Rem from the .30-06 Springfield case). As you will see in my

discussion regarding shots beyond 400 yards a bit later on, you're not gaining a whole lot with some overrated big boomer that requires its own special bank account dedicated to handloading it. "Keep it simple," and "If it ain't broke, don't fix it" are two mottoes you should live by.

ONLINE BALLISTICS PROGRAMS

We never had these back in the old days, but I'm sure glad we have them now. Today, bullet and ammunition manufacturers publish vast amounts of information directly on the Internet, and getting a handle on one bullet over another is a simple matter of logging on to the websites of Hornady, Sierra, Barnes, Nosler, Hodgdon, and others and reading through the material. Manufacturer catalogs are also a big help, as are reloading manuals that cover a wide range of cartridge and bullet types. Even with my 30 years of extensive time behind the rifle and in the field hunting, I often turn to the manuals and Internet data when working through a new cartridge, or even reworking an old standard cartridge for a story. It is just good sense to do so.

THE RULE OF 400

When we start to think of shooting long-range, and I mean *really* long-range, we are taking the extreme case and moving that bullet past 400 yards into a world of unknowns. That's because, at 400 yards, and regardless the rifle (except for the super guns in .50 BMG or possibly the Barret .416 Supersonic), nearly all projectile velocity starts to die off quickly and the drop factor really rears its ugly head. If you have trouble believing this, just open any factory ammunition catalog and run down the list of rifle cartridges. Pick one. Now, move to the far right and check out the bullet velocity and drop as it passes the 400-yard mark. Heck, in some cases, the

manufacture won't even list a load past 400 yards, because it has dropped that far off the performance grid.

Remember, bullets start to drop the moment they leave the barrel. If you shoot a rifle bullet and, at the same time, drop the same bullet from a height that is exactly the same as the rifle's chamber, when that dropped bullet reaches the ground, your bullet, if shot from a level bore, will also hit the ground. About the only way to fight off the negative effects of the "400-yard rule" is to move your zero or point of dead-on aim farther out from, say, 100 to 200 or even 300 yards. As you move that zero point, you gain in trajectory, that rainbow arc effect.

As an example, let's take a load directly from one of Federal's catalogs, in this case the outstanding .308 Win with a 168-grain Sierra MatchKing hollowpoint boat-tail bullet. This bullet is *designed* for long range. When I was in the police service and training other officers, this cartridge and bullet combination was sought after by members of our sniper units, as well as those from other metro departments, when tough, long-range tests came along. Military snipers also favor this long-range bullet, because of its grain weight, velocity retention, drop factors, and energy transfer to a warm target. Of course, for some in these capacities, it could also have something to do with the fact that the .308 is a light machine gun round, but that's another story. What I'm getting at is that the 168-grain .308 is a preferred load among long-range shooters. (Still, when shooting at long range, don't assume that all that power and energy are going to remain all the way to the target. It's just not.)

All right, you're probably wondering, why not move up to the big guys? Well, let's take the .300 Win. Mag., as an example. With this round, you're shooting a very large fuel cell, but it has a bullet similar to the one used in the .308 Win., so it's a valid comparison—yet both end up looking darn

weak at the 400-yard mark. (In fact, Federal's website lists both cartridges and their trajectories out to 300 yards, where drop is already both significant and readily apparent.)

Can you work with such ballistics? Sure, it's done all the time, but it requires learning your rifle, and to do that you've got to shoot at long range and shoot often. By way of example, my friends who were snipers on entry teams and other special units shot every other week for at least a half-day on the 200-/300-yard range. Shooting cold barrels so as to keep groups very tight, these snipers trained for one-hole groups at 200 yards, duplicating the taking out of a very bad guy in a hostage situation with an eye hit or a hit just above the lip. Yet, as much as they practiced, when they pushed those Remington M-24 military sniper rifles much beyond 300 yards, things got dicey. Bullets at those ranges kind of have a mind of their own.



This hunter is shooting a 6mmx284 on long-range coyotes. He owns that valley out to 600 yards or more, but he must know his rifle and bullet well to get reliable performance at those distances.

BULLET DROP: .308 WINCHESTER WITH 168-GR. SIERRA MATCHKING

(Federal Factory Load)

Make: Federal Premium 308 Winchester (7.62 NATO)

Bullet: 168-grain Sierra MatchKing Hollowpoint Boattail

Barrel: 30-inch Test Barrel

RANGE (Yards)	VELOCITY (fps)	WIND DRIFT IN INCHES. (10 mph Crosswind)	MID-RANGE TRAJECTORY (Inches)	
			100 Yd. Zero	200 Yd. Zero
0	2600	0	–	–
100	2410	0.7	Zero	-plus2.3
200	2230	3.2	-4.4	Zero
300	2060	7.6	-15.8	-9.3
400	1890	13.9	–	-25.9
500	1730	22.9	–	-52.1

[View a text version of this table](#)

.308 WINCHESTER AVERAGE RANGE

Trajectory for a 100 yards zero with a sight height of 1.5 inches

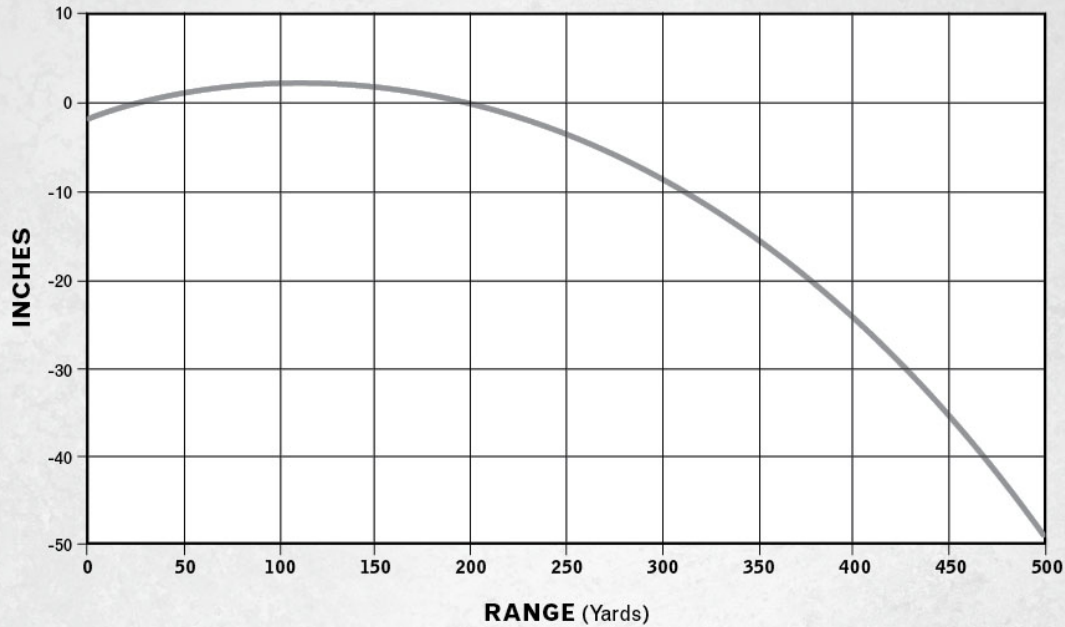
50 Y	100 Y	200 Y	300 Y
-0.1	0	-4.0	-14.5



.308 WINCHESTER LONG RANGE

Trajectory for a 200 yards zero with a sight height of 1.5 inches

50 Y	100 Y	200 Y	300 Y	400 Y	500 Y
0.9	2.0	0	-8.5	-24.5	-49.0



Can you improve on long-range ballistics at all? Yes, just review the ballistics associated with those lighter weight .25-calibers. Here, again, my old tried and true .25-06 stands tall, shaving off drop at 500 yards and greatly improving bullet impact levels at 400 yards. But how does it do this when the big boys can't keep up?

Shooting a bullet that is 80 grains lighter than that of the .300 Win. Mag., the .25-06 is, of course, no match to the big magnum's energy. However, *energy* is not what we need to go the distance. Rather, it is the reduced or flat *trajectory* that has the most bearing upon downrange impact. In effect, the .25-06 will do for the longer-range shooter to at least 500 yards what the much heavier magnums will do at half that. This is why, when you get into the Western states, calibers in the .25s and .270s are so popular among

locals for everything from varmints to coyotes and even much of the available big game.



Brezny glassing a dog town in western South Dakota. Ranges here can get very long very fast. Moving through the 400-yard range is easy, and the shooter needs to be very aware of all the conditions that can cause a miss.

BULLET DROP: .300 WINCHESTER WITH NOSLER 168-GR. SOLID BASE BOATTAIL *(Federal Factory Load)*

Make: Federal Premium 300 Winchester Magnum

Bullet: 165-grain Nosler Solid Base Boattail

Barrel: 30-inch Test Barrel

RANGE (Yards)	VELOCITY (fps)	WIND DRIFT IN INCHES. (10 mph Crosswind)	MID-RANGE TRAJECTORY (Inches)	
			100 Yd. Zero	200 Yd. Zero
0	3140	0	–	–
100	2910	0.6	Zero	–
200	2700	2.6	-2.6	Zero
300	2470	6.2	-10.0	-6.1
400	2250	11.3	–	-17.7
500	2120	18.6	–	-36.0

[View a text version of this table](#)

.300 WINCHESTER AVERAGE RANGE

Trajectory for a 100 yards zero with a sight height of 1.5 inches

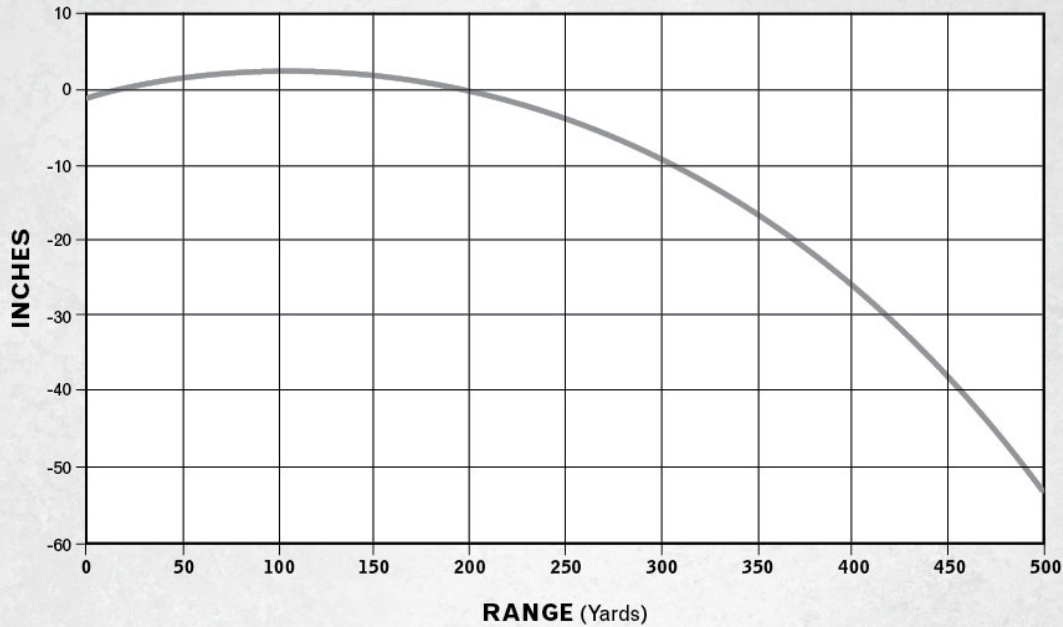
50 Y	100 Y	200 Y	300 Y
-0.1	0	-4.2	-15.2



.300 WINCHESTER LONG RANGE

Trajectory for a 200 yards zero with a sight height of 1.5 inches

50 Y	100 Y	200 Y	300 Y	400 Y	500 Y
0.9	2.1	0	-8.9	-25.9	-53.3



STEADY-EDDIE LONG-RANGE CARTRIDGES

Though we've already discussed a number of long-range cartridges, let's take a closer look at some of the best of them. These are the ones that make the grade year after year, when the flash in the pans have come and gone, and they're also the ones generally most available and easier on the handloader's wallet than the flashier cartridges.

.243 Winchester

This cartridge gets short shrift sometimes, often relegated to the ranks of "average." Yet, with available bullets ranging in weight from 55-grain to 105-grain, this cartridge in the right gun and the right hands can do for everything from prairie dogs to black bear. Naturally, the black bear is

likely a closer range proposition, but pop some 55-grain rounds into a .243 chamber and prairie dogs are doable to 400 yards, coyotes are dead with 65-grain options, and even antelope are goners with a skilled set of hands shooting a heavier 85-grain bullet at this distance. Factor in some really mild recoil, over-the-counter availability, and easy handloading costs, and “average” seems woefully understated.



The author with a .223 Ruger M-77 and a 300-yard crow. Keeping light rifle cartridge performance inside 400 yards will ensure good results.

.25-06 Remington

Once a dedicated wildcat cartridge, the .25-06 came about prior to WWII and found its niche when surplus powders were turned loose to handloaders

after the war. A necked-down .30-06 case paired with a .25-caliber bullet, this speedster can hold velocity, energy, and flat trajectory well out to 400-plus yards. Nowadays, factory cartridge brass is an easy find, as is necked-down (one step) .30-06 brass. Load and bullet combinations are nearly limitless with this round, making it a handloader's joy.

6mmx284

The 6mmx284 is a home-rolled cartridge based on the .284 Winchester. The .284, originally commercially unsuccessful, has enjoyed some renewed attention from long-range shooters, but its 6mm cousin is the one that's extremely popular among serious benchrest competitors and varmint shooters. The short case allows for a short-action throw, and that can mean accuracy with less action flex during firing. Ballistics obtained by the 6mmx284 are about the same as those of the 6mmx'06 wildcat. The case is easily formed from .30-06 brass, and, except for its need for a longer action, the 6mmx'06 returns about the same downrange results as the 6mmx284. All rifles designed for the 6mmx284 need to be hand-built, as no off-the-shelf factory rifle is currently chambered for the cartridge. This can add up in both handloading expense, as well as the basic cost of the rifle, something you'll have to weigh against the benefits of having this deadly long-range cartridge.



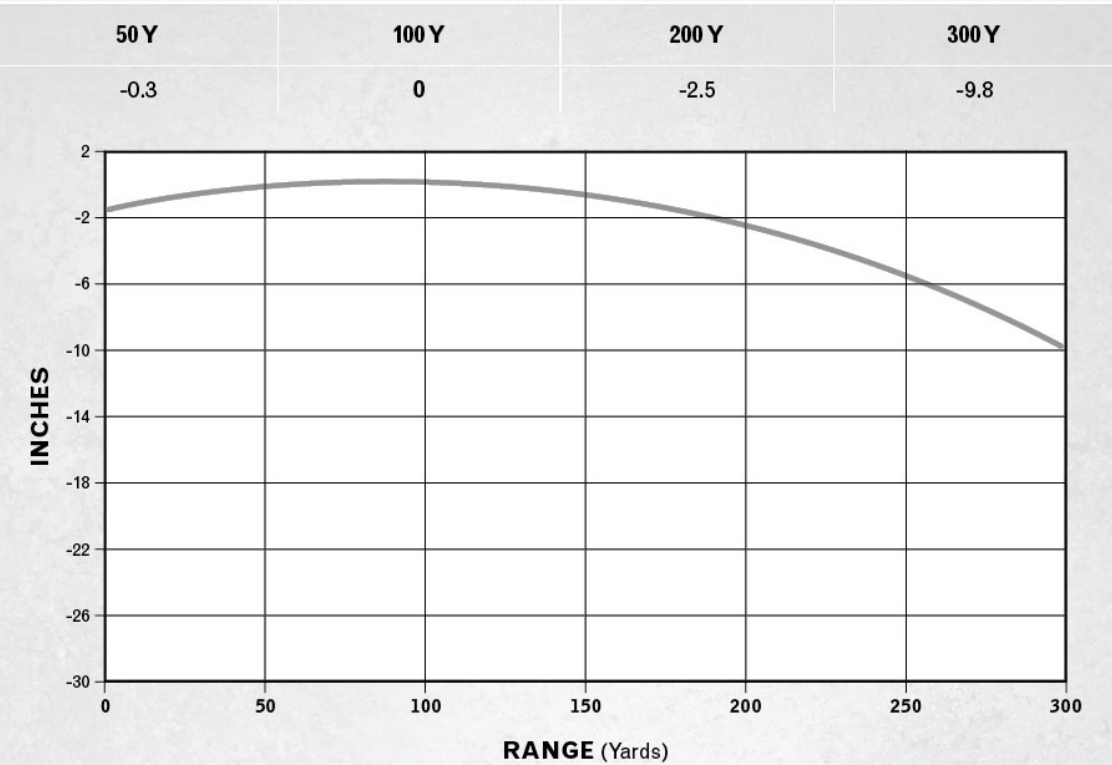
On the right, holding his black Remington 700 custom rifle, is Greg Hendricks, mentioned elsewhere in this book. Greg, a 1,000-yard competitive rifle shooter, is known to study a 600-yard shot with his basic .223 Rem. for an hour prior to making it, often as a one-shot kill, when winds are down and shooting conditions are good. His partner here is Jerry Martin, shown with his Ruger MK II in .223 Rem. Often the team will spot long shots for each other.



The author with a South Dakota speed goat. This winter meat doe went down at almost 400 yards via a Winchester Model 70 chambered in .243 WSSM wearing a handloaded Barnes 85-grain XLC bullet. Learning to shoot long range can add up to real benefits during the big-game hunting season.

.243 WINCHESTER AVERAGE RANGE

Trajectory for a 100 yards zero with a sight height of 1.5 inches.



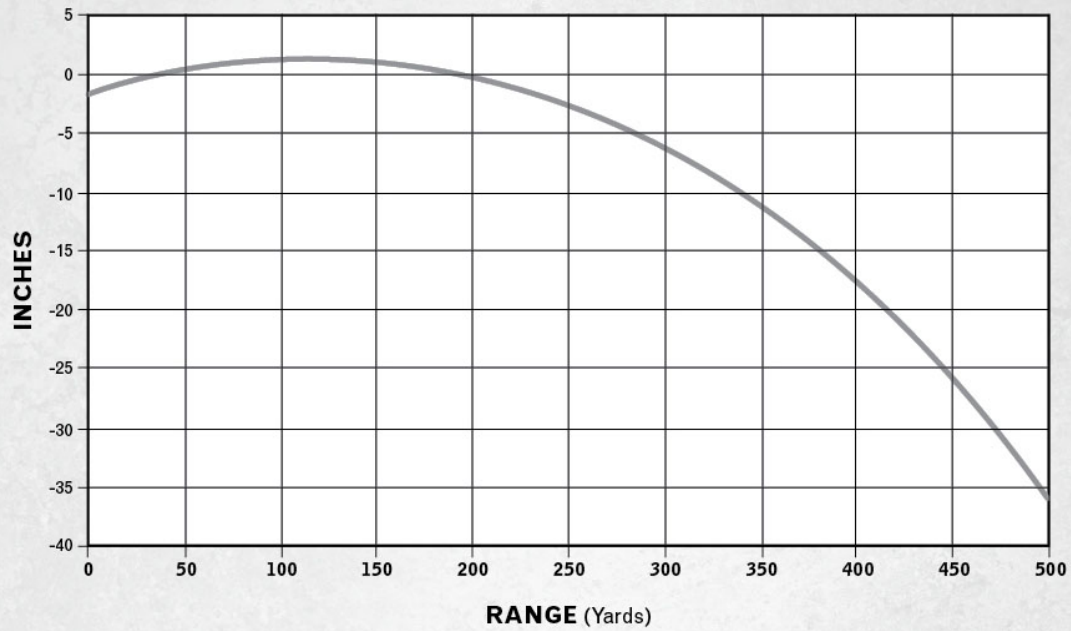


The author zeroing his .243 WSSM prior to a hog hunt in Texas. This rifle/cartridge took several 400-plus yard hogs during this specific event. Bullet: a 64-grain factory Power Point.

.243 WINCHESTER LONG RANGE

Trajectory for a 200 yards zero with a sight height of 1.5 inches

50 Y	100 Y	200 Y	300 Y	400 Y	500 Y
0.3	1.3	0	-6.0	-17.6	-36.2





Using light rifles and cartridges at closer range can be less aggravating when shooting a full day on a prairie dog town, or woodchuck patch.

.25-06 VARMINT/GAME HANDLOADS

Courtesy Ballistics Research & Development, Piedmont, South Dakota

Shooting at 6,500 feet above sea level. **Temp:** 55° F **Tailwind:** 5 mph

1 Type: Coyote Load

Bullet: Sierra 87-grain

Varminter. **Powder/Charge:** 47.2 grains
of Reloder 15 **Primer:** Fed 210M Primer

Overall Length ("): 3.46

Muzzle Velocity (fps): 3,425

Case: Government 30-06

necked to .25-06 **Benchrest Accuracy at 100 yds. ("): .882**

2 Type: Windy Coyote Load

Bullet: Sierra 117-grain spitzer

Powder/Charge: 49.3 grains of Ramshot Hunter

Primer: Fed 210M Primer

Overall Length (“): 3.155

Muzzle Velocity (fps): 2,861

Case: Remington Factory .25-06

Benchrest Accuracy at 100 yds. (“): .994

Note: This load as loaded by Author harvested a large mule deer buck at 523 yards; gun used was a T/C Encore.

3 Type: Prairie Dog/Coyote Load

Bullet: Hornady 75-grain V-Max

Powder/Charge: 56.5 grains of Ramshot Hunter

Primer: Fed 210M Primer

Overall Length (“): 3.160

Muzzle Velocity (fps): 3,537

Case: Government .30-06 necked to .25-06

Benchrest Accuracy at 100 yds. (“): 1.238

4 Type: Long-Range Coyote Load (Federal Factory Load)

Bullet: 90-grain Sierra Varminter hollowpoint **Powder/Charge:** n/a

Primer: n/a

Muzzle Velocity (fps): 3,440

Case: Government .30-06 necked to. 25-06

Benchrest Accuracy at 100 yds. (“): .894

5 Type: Long Range/High Wind Coyote Load; Long Range Deer & Goats

Bullet: Barnes 90-grain XBT

Powder/Charge: 53.0 grains Ramshot Hunter

Primer: Fed 210M Primer

Overall Length ("): 3.180

Muzzle Velocity (fps): 3,216

Case: Government .30-06 necked to .25-06

Benchrest Accuracy at 100 yds. ("): 1.221

6 Type: Coyote, Prairie Dog Load

Bullet: Speer 87-grain spitzer

Powder/Charge: 57.3 grains Reloader 19

Primer: Fed 210M Primer

Overall Length ("): 3.09

Muzzle Velocity (fps): 3,525

Case: Federal factory

Benchrest Accuracy at 100 yds. ("): .786

7 Type: Long Range/Wind; Deer, Goats, Coyote Load

Bullet: Sierra 90-grain HPBT GameKing

Powder/Charge: 51.0 grains H414

Primer: Fed 210 M Primer

Overall Length ("): 3.100

Muzzle Velocity (fps): 3,315

Case: Federal factory

Benchrest Accuracy at 100 yds. ("): 1.033

8 Type: Coyote, Deer/Goats, Long-Range/High Winds

Bullet: Sierra 90-grain GameKing HPBT

Powder/Charge: 45.0 grains Varget

Primer: Fed 210M Primer

Overall Length ("): 3.100

Muzzle Velocity (fps): 3,312

Case: Federal factory

Benchrest Accuracy at 100 yds. ("): .944

9 Type: Big Game/Windy Conditions on Long-Range Coyotes

Bullet: Nosler 100-grain Partition

Powder/Charge: 44.0 grains Varget

Primer: Fed 210M Primer

Overall Length ("): 3.200

Muzzle Velocity (fps): 3,125

Case: Government .30-06 necked to .25-06

Benchrest Accuracy at 100 yds. ("): .995

NOTE: RELOADING TIP

If you want to keep reloading to a very accurate and simple level, buy factory-loaded cartridges and save the fired brass for reloading. With neck sizing only after firing (only for bolt-action rifles), you can reload to benchrest accuracy levels and work at an even easier pace.

BULLET DROP: .25-06 REMINGTON 85-GR. NOSLER BOATTAIL BALLISTIC TIP (Federal Factory Load)

Make: Federal Factory Load

Bullet: 85-grain Nosler Boattail Ballistic Tip

Barrel: 30-inch Test Barrel

RANGE (Yards)	VELOCITY (fps)	WIND DRIFT IN INCHES. (10 mph Crosswind)	MID-RANGE TRAJECTORY (Inches)	
			100 Yd. Zero	200 Yd. Zero
0	3350	0	–	–
100	3230	0.7	Zero	–
200	2930	3.0	-1.8	Zero
300	2640	7.2	-7.8	-6.8
400	2380	13.3	–	-17.5
500	2130	22.0	–	-35.8

[View a text version of this table](#)

.25-06 REMINGTON AVERAGE RANGE

Trajectory for a 100 yards zero with a sight height of 1.5 inches

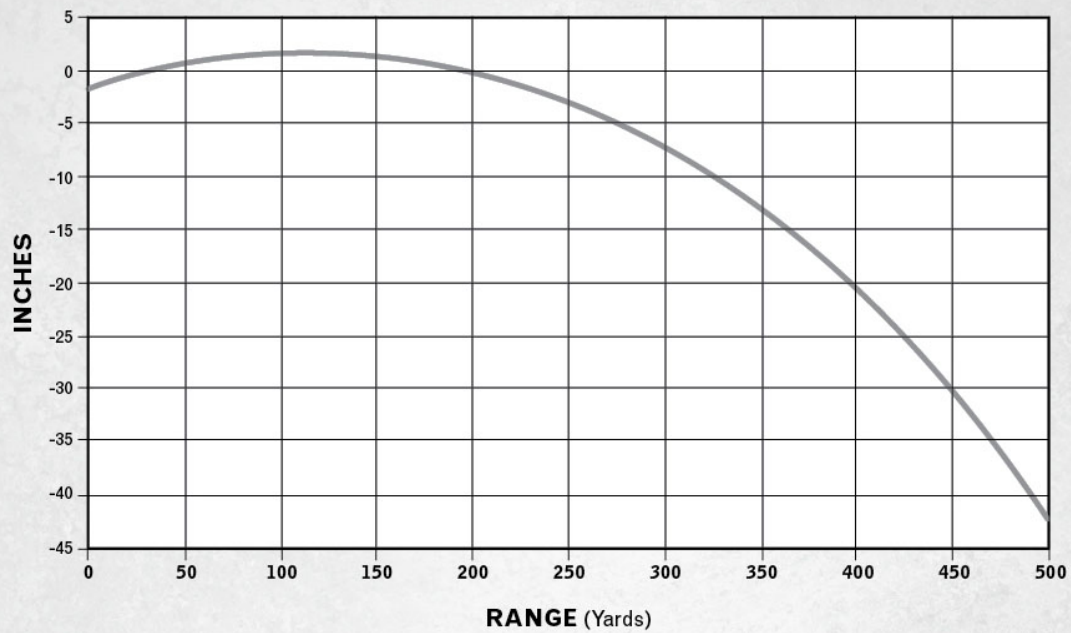
50 Y	100 Y	200 Y	300 Y
-0.2	0	-3.1	-11.6



.25-06 REMINGTON LONG RANGE

Trajectory for a 200 yards zero with a sight height of 1.5 inches

50 Y	100 Y	200 Y	300 Y	400 Y	500 Y
0.5	1.5	0	-7.0	-20.8	-42.5





**Brezny handloads for the .25-06 Rem., his go-to cartridge in western South Dakota.
Handloading can make it a light-shooting dog gun or a heavyweight mule deer killer as well.**

HANDLOADING FOR THE MAGNIFICENT .25-06

Handloading the .25-06 is an exercise in simplicity, and that's something that fits many of the criteria for a smart cartridge choice (e.g., easy to find components). Indeed, the round is a dream cartridge to handload for, even though its lineage stems from a wildcat idea from 1920; Simply lube a .30-06 case and run it through a standard full-length .25-06 sizing die. Generally, the case won't require trimming, as the brass will not tend to flow greatly, and, at least in the two different rifles I've used over the years, there was never even a slight level of case binding during chambering of a reloaded cartridge. Dies used for all my handloading in this round were RCBS standard two-die sets, and much of my reformed brass was reworked .30-06 military cases gleaned during my old M1 Garand days on a Minnesota rifle range.

In addition to being an excellent choice for larger varmints, the .25-06 is just one of the best cartridges ever made for taking on most North American game and even a number of the African offerings. As a flexible varmint/game cartridge for long-range shooting, you will have to go a very long way to outgun this long .25-caliber.

One tip on reloading for this cartridge: If you want to keep your reloading tastes to a very accurate but simple level, buy factory-loaded cartridges and save the fired brass for reloading. Now everything gets a full-notch simpler, since you don't have to search out .30-06 cases and resize them. With neck sizing only (only for

bolt guns), after firing your factory .25-06 rounds, you can reload to benchrest accuracy levels. My nine pet loads appear on the opposite page.

.257 Weatherby Magnum

Before you get all excited, I am not about to tell you that a .25-caliber bullet is able to return anything close to what one of the really big guys can produce downrange. However, when it comes to the “rule of 400,” this kind of less than mainstream round has got some spunk.

Quarter-bore cartridges have always been outstanding Western states deer and other large game cartridge. For me, after living with the .25-06 for many years and taking many animals with that cartridge, it seemed that the time had come to work with something a little stiffer, the .257 Weatherby Magnum. This belted cartridge was Roy Weatherby’s first innovation and his very favorite, in spite of all the great cartridges he came up with over the years.

In keeping with the round, I chose the Weatherby synthetic-stocked Back Country model, a rifle based on the 24-inch fluted barreled Vanguard. Shooting my handloaded round for it, one consisting of Norma brass, a 115-grain Barnes Triple Shock X-Bullet, and a 66.0-grain charge of Norma MRP. The whole deal runs downrange at a solid 3,100 fps. No, that’s not rocket force stuff, but it is a solid killer to 500 yards if the critter is bedded, 400 yards and change if it is moving or standing. (Why the difference here? Because bullets take time to get to targets and animals tend to move if standing a good deal of the time. I know some won’t agree with me here, but standing shots at long range make for wounded big game, end of story. Yes, I hope the TV outdoor channel shows are paying attention here.) In all,

the ballistics associated with the .257 Weatherby Magnum are nothing but flat to 400 yards.

I have hunted the Dakotas and Wyoming with this rifle and cartridge and never lost an animal, nor put a bullet in a location that caused the critter undue stress. At 300 yards, the bullet drop with this round is about five inches with a 200-yard zero, and, at 400 yards, it's still a manageable 17 inches.

7mm Remington Magnum

This is my top choice as a long-range prairie dog rifle. For use in my personal "Big Seven," I have added high-magnification glass and handloaded, lightweight 110-grain bullets. A spotter is required with this larger, belted magnum cartridge, due to recoil (it's certainly tolerable, but also, obviously, more than a .223).



The Author took this 200-pound dressed weight 5x4 whitetail with a .257 Weatherby at a stellar 440 yards. Brezny handloaded the round with 115-grain Barnes X Bullets (again, note how a lighter bullet/smaller cartridge surpasses some of the bigger rounds in the “rule of 400” realm).

This round will really deliver the mail, thanks to its flat shooting characteristics. The downside to this round is that handloading costs are high, thanks to the big belted case and its high volume of powder. If I were starting from scratch and looking for a do-it-all long-range round, I'd select a different option, probably the .300 Win. Mag., but, if you're already in the game and cost isn't your biggest concern, then the ability to range your bullets from 110-grain to 175-grain provides great flexibility.

Getting a large-caliber or belted magnum big-game rifle into some distant varmint requires some special handling. When the heavyweight rifles start to cook, some fun and interesting results surface, be it prairie dog hunting, whistle pig shoots, or canine control forays.

My 7mm Remington Magnum had lain in mothballs for several seasons, due, in part, to the fact that I just didn't have anything east of the Mississippi at which to shoot the big rifle. But, after I made the move from Minnesota to South Dakota, I decided to bring out the 7mm and put it to work permanently.

This long-range shooter consisted of a standard Ruger No. 1 with a trigger that was next to none in tack-driving quality, and a lightweight barrel that, if kept cool, would group 1 MOA clusters all day long. Previous to its return from retirement, I hadn't sent anything through the rifle but Hornady 150-grain soft-point pills as home-rolled fodder off my reloading bench, those aimed at mule deer around Ten Sleep, Wyoming. As the rifle had accounted for a good share of well-placed bullets at 300 through 400 yards, I didn't think twice about mounting some different glass on the big

rifle and developing a fast, flat-shooting load to take west on my annual spring hunt on South Dakota dog towns.

To be quite frank, I was getting a bit bored with sitting down and busting several hundred caps on with the .22-250 and .243. It seemed that missing them just wasn't a part of the gunning equation with these rounds. What I wanted to do was push the limits with my heavy-caliber rifle at some exceedingly long-range critters. Why the 7mm Remington Magnum? Because it was there and I didn't have to develop a payment plan to come up with an alternative long-range rifle/cartridge system.

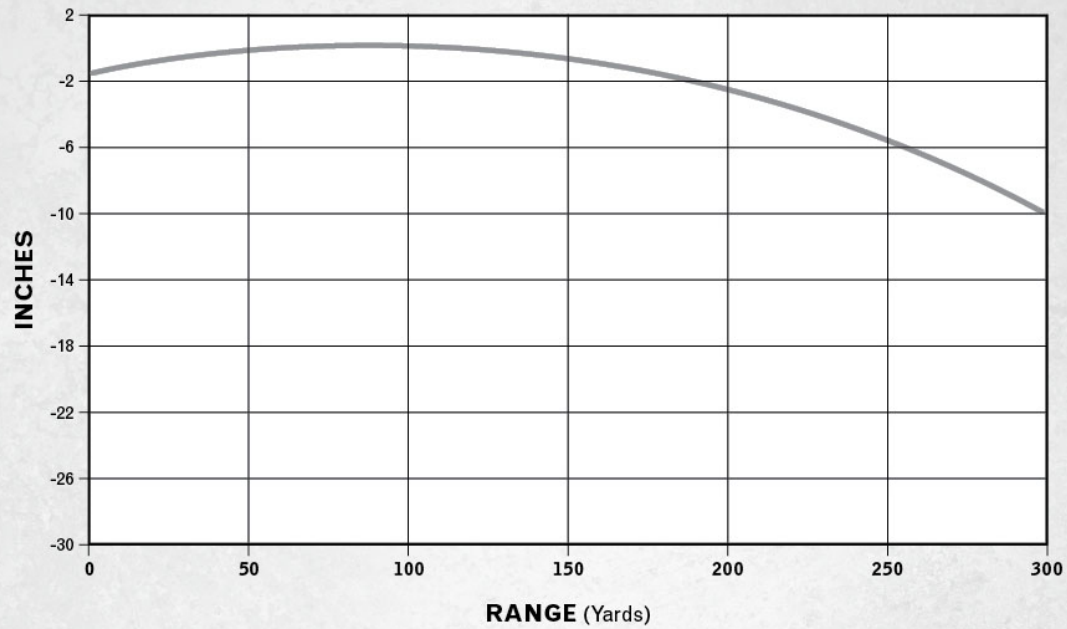


The author's 7mm Remington Magnum and 50x glass. This is an ultra long-range rifle set up for dog shooting to 1,000 yards, if required.

7MM REMINGTON MAGNUM AVERAGE RANGE

Trajectory for a 100 yards zero with a sight height of 1.5 inches

50 Y	100 Y	200 Y	300 Y
-0.3	0	-2.7	-10.2





7mm Rem. Mag. in the loading gate of the Ruger single-shot rifle.

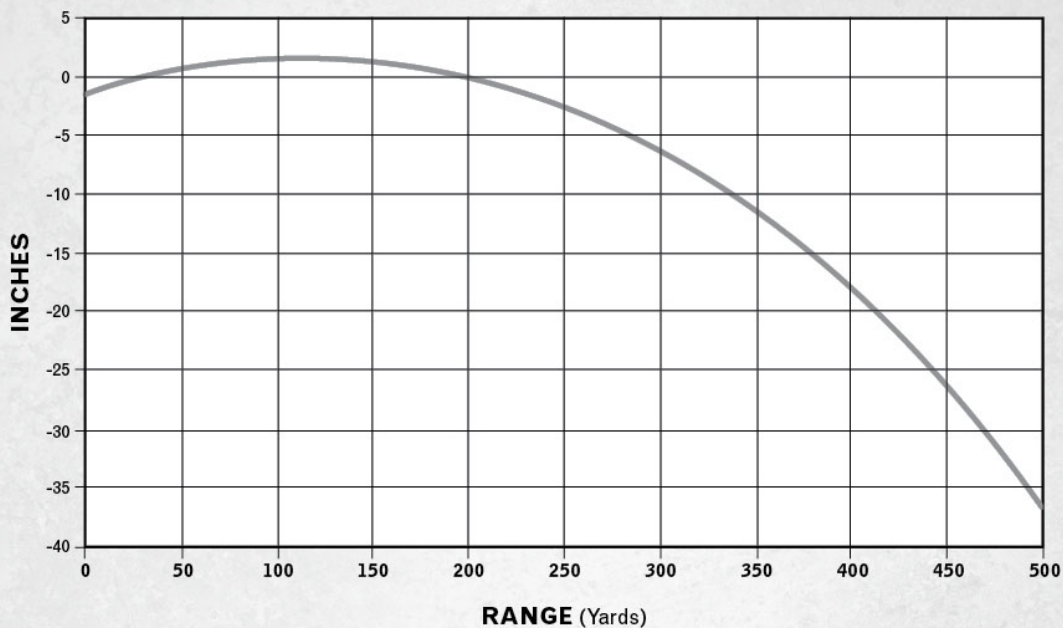
While I'm sure the 7mm STW, .300 Win. Mag., .300 Weatherby Magnum, and even the .300 WSM would push bullets quite effectively (based on data provided by various powder manufacturers), the 7mm Remington Magnum drives a heavyweight bullet fast enough to fight off western open country winds, without leaving me watery eyed as soon as I dropped three pounds on its tuned trigger. (As a side note, this cartridge has also been chambered in a number of military sniper weapons and offered right alongside the .300 Win. Mag. in some rifles for those professional long-range shooters considering a change in caliber. If it's good for them, might as well be good for you and me.)

When selecting a scope for my long-range setup, I turned to a Tasco I had on hand that was designed for ultra long-range work. It was Custom Shop 10-50x that makes use of a large parallax adjustment wheel calibrated from 10 through 400 yards, then off to infinity. With its double sunshade and massive 50mm bell, the scope length reached to within seven inches of the rifle's muzzle. With its ¼-MOA windage and elevation adjustments, the scope could be pre-set for any zero range and then moved up or down to accommodate bullet trajectory. In my experience with field scopes of this type, this glass was by far the best I've owned, in terms of getting a quality sight picture on a very distant target.

7MM REMINGTON MAGNUM LONG RANGE

Trajectory for a 200 yards zero with a sight height of 1.5 inches

50 Y	100 Y	200 Y	300 Y	400 Y	500 Y
0.4	1.4	0	-6.2	-18.1	-36.7



In my search for a bullet for the big rifle, my partner Ross Metzger, of SHOTdata Systems in New Brighton, Minnesota, came to my aid. Ross brought up his self-designed ballistics program to review various bullet designs and weights, then settled on one bullet that seemed to meet my needs. This 7mm pill was a Speer 110-grain bullet, a .284-caliber hollowpoint TNT that retained the best ballistics coefficient across various long-range field situations. While a lighter bullet such as the TNT 100-grain pill could have reduced recoil a bit, the fact remained that this 110-grain configuration met my requirements for a very long-haul dog bullet, while also giving me the most performance for my grains of burning powder. For those of you who need to know the fine details, the Speer 110-grain TNT retains a ballistic coefficient of 0.3380.

I elected to use Hodgdon's Varget as my first powder choice, because I had been shooting large quantities of it for some time and had found it to produce very uniform ballistics in both low and high temperatures. In effect, the loads could return good results on 'yotes in the Dakotas during December, or prairie dogs in the heat of July, if necessary. As a new addition to my fire-making tools, I turned to the powder offerings by Ramshot, which indicated I would be more than pleased with the results from blends of Big Boy Powder. As listed in its loading manual, a Sierra 130-grain HPBT called for 78.50 grains of Big Boy behind it. This rocket-fuel package is set off by a Winchester Large Rifle Magnum primer, for a muzzle velocity of 3,270 fps. Since I figured on cutting to the 110-grain Speer TNT and, if the burn held up with the lighter-weight bullet, I should pick up a couple of hundred feet in velocity while still holding chamber pressures at acceptable limits.

Varget powder, according to the Hodgdon manual, called for a 54-grain starter charge to drive the 110-grain pill at 3,174 fps. Chamber pressure

stood at a book listed 44.600 CUP, making this a gentle giant, when shooting off the benchrest. As it was to turn out, the bench work involving the Varget loads was flawless, and getting the big scope and belted magnum dog loads zeroed in was a walk in the park, at least to the 200-yard marker. Now I only needed to increase the Varget powder charges to a full-house 58.5-grain dose to watch the velocity peak at 3,356 fps and the chamber pressure top out at 50.300 CUP.

Even though the Ruger No. 1 tended to “walk up” a bit as its pipe got warm, I stayed with a low volume of rounds through the gun at one time and minimized the effects. Doing so, I was able to obtain workable groups that were well within my required limits of sub-moa performance. I did get an occasional flyer, but I attributed that to the heavy rifle’s recoil and muzzle blast, something exacerbated by my shooting in a half-enclosed bench-rest house. When you have been sending rounds downrange via the .22-250, .243, and even the .25-06 for months on end, this belted 7mm Magnum cannon can be a bit much to get used to.

Overall, I liked the ballistics of the 110-grain Speer bullets in the Big Seven, and, when I got the gun into the field, the bullet and load quickly revealed pinpoint accuracy. Recoil was not overly disturbing, and having a spotter at my side giving me a clear picture of each bullet’s impact at long range made things even easier. The big 110-grain bullets entered into dog lodges with enough energy to blow the tops off them, and, if I didn’t hit the dog outright, I sure did bury it on the spot with a spray of earth.



My partner Ross Metzger shooting the 7mm Mag. in the Ruger No.1.

Truly, with the big 50x Tasco mounted on the Ruger No. 1, I owned the field. When shooting, I turned down my magnification to about 14x, but, afterward, I moved up the power to its full 50x, as I checked over my handiwork on the dog lodges.

The one drawback to this setup is that shooting fatigue began to set in faster than usual. There's a difference between shooting the .22-250 Rem. or .223 Rem. and a big gun such as this. The big blast will start to get to you, if you're gunning high-volume dog targets, and taking frequent breaks is a good way to approach the use of the heavy calibers for long-range shooting.

With the vast numbers of heavy rifles and cartridges in use today, I'm not about to say the 7mm Rem. Mag. is the best or the only way to go. For the most part, the straightforward .308 Winchester will get anything done you're likely to come across in the field, and, to be sure, it has built quite a reputation as a sniper's tool and on the target range as a 1,000-yard winner. But, out here in my part of the country, the western South Dakota crowd tends to look at the .308 Winchester as a medium to light rifle system, the same way Eastern shooters view the .223 Remington on their 100- and 200-yard urban rifle ranges. I'm being general here, of course, but I've found that the farther west you travel, the bigger the rifles and the longer the range. I guess that's just natural, given the fact that we have a lot of space and darn few people to get in the way.

.270 Winchester

Between the .30-06 crowd and the guys who shoot the .270 Win, the fight still rages on as to which is the better. Kind of a Ford versus Chevy kind of thing. No matter which side you're on, this is a very popular rifle in the Western states. Ballistics with the .270 Win are long-range all the way, and this cartridge doubles nicely as a heavy big-game round. Pills run as small as 90 grains (tough to find, but out there), and as large as 150. Drop is manageable at the 400-yard mark, with 130-grain bullets still adaptable at 19.1 inches down and just 22 inches for the biggest 150-grain.

.308 Winchester (7.62 mm NATO)

Our current light machine gun cartridge is one also very popular among military and police snipers. It is a solid choice as a long-range cartridge. After owning two Remington VS rifles chambered in .308, I can see why the military has based much of its sniper training on a variant of this rifle,

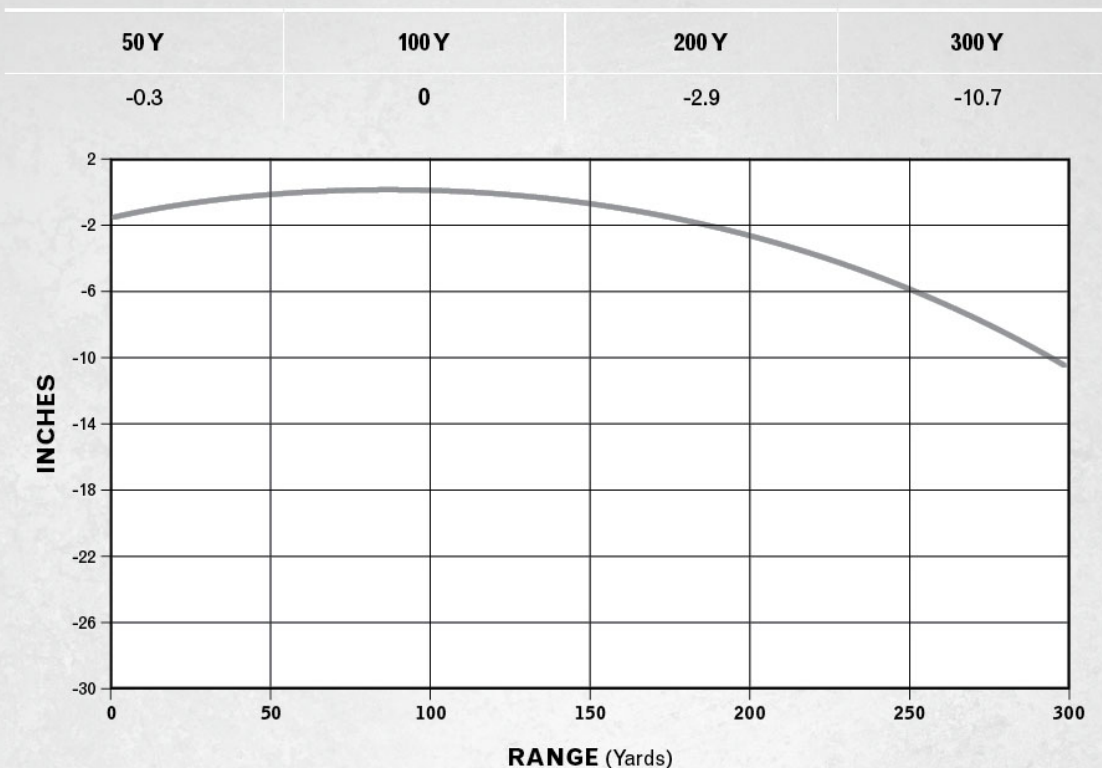
the M-24. Of course, when any cartridge is or has been military issue, it is assured a very long life in the game of shooting.



Brezny behind the Savage Model 10 .308 Win. at the Hutton ranch. This is an accurate and very effective shooting system developed by Savage Arms. You can live with the price tag, as well.

.270 WINCHESTER AVERAGE RANGE

Trajectory for a 100 yards zero with a sight height of 1.5 inches



As I said when talking about the 7mm, while it was fun to play with and certainly effective at long range, if you're looking to go bigger, then the .308 is probably the most natural choice. While the .308 is regarded as a light rifle by my local buddies out here in the West, the fact is this is one heck of a good long-range cartridge, especially as it was born as a benchrest cartridge well before being picked up by the military on a worldwide basis.

Savage Arms stepped forward when it got word about this book and consigned to me the new H-S Precision-stocked Model 10 LE (Law Enforcement), a police sniper rifle in .308 Winchester. The Model 10 is all guts and go, with few fancy add-ons. The barrel is mated to an aluminum pillar bedding block designed by H-S Precision, and the gun retains the

famous AccuTrigger, among the best of the best factory configurations for coaxing accuracy out of a given rifle. A Picatinny mount for a Weaver-type ring is solid as a rock. With this class-act setup, I locked Weaver Grand Slam rings around a new Leupold VXL 4.5-14x50mm with the Boone & Crockett reticle.

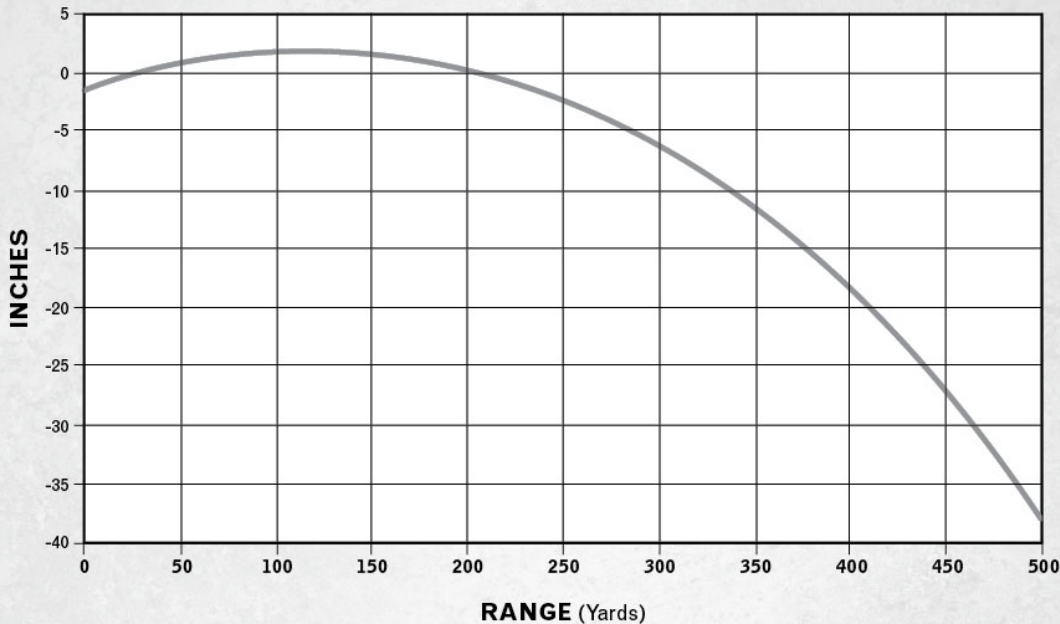
The Savage came with a 100-yard factory-shot target that indicated it would punch a group of a ½-inch from the bench. *Those were just the first three rounds out of her pipe*, my friends, so, after breaking in the green bore, I fully expected to see a one-hole shooter at 100 yards.

Because I was not set up to handload the .308 Winchester at the time, I turned to Remington for one of its loads with a 165-grain Sierra MatchKing during my first encounter with grass rats in Wyoming. During zeroing of the new rifle, I discovered a gun that could just about lay each shot over the other at 100 yards, given dead-still air. This was a dream rifle to shoot. Its balance was dead-center perfect, its recoil was easy on the old hide—just a gentle roll before settling down—and its buttstock fit my shoulder like it was custom fit. With a sharp drop at the pistol grip, the rifle falls naturally into line for use with a large-ring scope, and the three-pound, fully adjustable trigger is as smooth as wet ice. Bottom line, if you guys are searching for a very accurate rifle in a .30-caliber, you'd do well to consider this member of the Savage high-power line.

.270 WINCHESTER LONG RANGE

Trajectory for a 200 yards zero with a sight height of 1.5 inches

50 Y	100 Y	200 Y	300 Y	400 Y	500 Y
0.5	1.4	0	-6.4	-18.8	-38.2



Wyoming in the spring of 2006 was prime ground for letting out the horses on the Savage Model 10 LE. Shooting on Ken Hutton's ranch near Hulett, Wyoming, I had all the ground I could cover in a three-day shoot, and, as there were shallow, rolling hills near the primary dog towns, I could stretch the range of the .308 Savage as far as I wanted.

Starting on a large town, I locked the new Savage LE down on a set of Caldwell bag rests laid on a CaseGard bench table and pointed the rifle down a long, half-mile dog town backed by a creek bed's steep bank some 1,400 yards distant. With the winds building to a stiff blow out of the northeast, I quickly realized I would be restricted to shots straight downwind. Any change in shooting angle, even something as little as five

or six degrees either side, would result in a real dogfight by the bullet against that steady high wind—and I was darned sure glad even at that, that I wasn't shooting something lighter.

With Ken acting as my spotter, I ranged a standing dog at 287 yards through the outstanding Swarovski LG Class 1 rangefinder, figuring to use the closer targets for warm up, especially with the bucking wind. With the crosshairs of the Leupold VX-L planted dead center on the dog, I touched off a 168-grain Sierra BTHP MatchKing that sent the dog someplace other than the top of the mound he'd been on.



Here a shooter and spotter are working a prairie dog town at long range. The spotter is required to get the shooter dialed in on target, using the “walking it in” method of getting a bullet into the kill zone.

After several more mid-range, 300-plus-yard shots in that area of the dog town, I was ready to push bullets farther downrange. Ken was glassing the town for likely targets and, within a minute or two he had a dog locked in—

but this guy was pushing 597 yards! With the wind, I was not at all sure about the shot, as even a slight push between the muzzle and out to 100 yards would keep that bullet moving off course. If I had not driven so far and covered so many miles of muddy, rutted, off-road trails to get into this town, I think I would have packed the day up right there. But I needed data, so I hunkered down.

Pushing my body into the rifle, I raised my focus to the first set of hash marks on to the Boone & Crockett reticle and touched off a round. Ken indicated I'd shoot low and somewhat left. *That left turn was wind for sure*, I thought, and even though I was about plumb straight to the target, I was shooting downhill and over rolling knobs that could develop drafting, subsequently changing my bullet's trajectory. This was not at all easy, and even the heavy .30-caliber was having a bad day against the stiff breeze.

The morning spent and with Ken having to get back to hay baling and running a working ranch, I was left alone to try and pull off some workable shots that would return some kind of usable information about the Savage LE in .308 Win. After Ken pulled out for the home place, I checked out an old broken-down structure that ranged 1,190 yards. One wall of the old building was still standing, and I judged it to be about eight feet high and positioned much like the old lean-to structures found throughout the West. (Please understand that this was something safe to shoot at, as I was the only living human for miles on this vast empty prairie.)

Pushing my hashmarks well beyond the centerline of the scope and holding about mid-way into the heavy duplex triple crosshair, I judged the elevation to be about five yards high. This rifle was zeroed to 200 yards, and I did not touch the elevation turret at all. With a pair of Walker's Game Ears in place and turned on high volume, I was going to wait to hear the thud of the bullet against the single standing wall of wood siding on the old

building. At the shot, the GameEar tracked the bullet for almost three seconds, but no other sound came to me except for the sound of the wind. I pushed the sights up another yard to what appeared to be about six feet in elevation and touched off round No. 2—and this time heard the confirming sound of a solid slap against a hard object.



The author shooting the Savage Model 10 LE at long-range targets over the expansive Badlands of northwestern South Dakota. This was a great “safe zone” to use when sending bullets well out beyond normal range limits.

Driving out toward the structure, I located a bullet hole about one-third of the way up the side of the worn log wall. I had indeed hit my target. But more than just a point of pride, the shot served to help me understand how a sniper can dial into a target like that at ultra long range and then keep some bad guys at bay with their heads down, while a fire or assault team gets into position.

After a fine dinner of shepherd's pie put up by my host Ken Hutton at H-Crown Outfitters, and a good night's sleep in the bunkhouse, I headed out early the next morning for Harding County, South Dakota, and my old friend Randy Routier's guide operation near the town of Buffalo. Randy had indicated that it was completely safe to push bullets far out over a section of Badlands on the ranch, and for targets I would have all the mud buttes I could shoot at, including every color and size of rock imaginable.

Upon reaching the ranch, I encountered a lady named Ronnie Shinabarger. Ronnie was Randy's full time assistant, as my friend needs some extra help, being confined to a wheelchair at all times. It was a lazy Sunday morning, and Randy had decided to join me and load up in his special van with ramps and backup gear. When we reached the mud buttes and Ronnie spotted my shooting equipment, she got on her cell phone and promptly called in her husband, Warren. Warren, like so many of our local folks, was an avid coyote and big-game hunter, and guns were a big part of his day-to-day world. What all this did was give me three spotters with the husband and wife team on field glasses and Randy covering the broad expanded landscape with his naked eyes (which are far better than most).

At first, as I had done in Wyoming, I elected to first take a few shots at targets ranging from 350 yards to just under 400 yards. Using the first hashmark at 400 and allowing for bullet climb, as we were shooting into a very deep canyon with a 10-degree drop in elevation from my shooting position, I found that it was not much trouble keeping bullets on mud-coated rock overhangs and outcroppings that stood against large, several hundred-foot-tall buttes.

Using Ronnie as my spotter, I soon discovered she was an iron-eyed individual; she simply didn't flinch at all with the bark of the .308. In fact, she turned into the fire control person for the day, as she picked out targets

and I ranged them, recorded them, and then shot them. Some good long-range shooting information on the .308 Win was starting to come together.

Pushing the .308 Win. to 677 yards (ranged), I proceeded to pull up two full hashmarks and halfway into the lower heavy line under the duplex point in the reticle. Again I declined to move the elevation turret off its 200-yard zero. After cracking a large rock at that range, I turned the rifle over to Warren, who, with my advice on where to hold, proceeded to crack the same big rock dead-center with his first round. We now had the .308 Win. dialed in and, as we switched positions spotting and shooting, it became very clear that once that scope is homed in on the target, the rest is simply breathing, hold, and trigger work.

Short story long, like the .25-06, .300 Win. Mag., 7mm Mag. and others, this rifle in .308 Win. is a great crossover piece of equipment. One day it's used on long-range dogs, the next on speed goats or elk. The Model 10 may be cop-shop sniper material, but it is all balance and accuracy, things always required of a good varmint/target rifle.

One concern that surfaced from the work that was done with the .308 Win was my choice in glass sights. While I could have mounted several other scopes on the Savage sniper rifle, I had elected to use the Leupold VX-L 4.5-14x50mm. The problem with this scope and scopes like it is that they're set up as big-game sighting systems and not ultra long-range tools. This scope, as outstanding as it is, and I mean that to the bone, didn't retain enough hashmarks, Mil Dots, or whatever else the makers today put in their reticles to get the job done.

Long-range glass requires several elements to be first-class at its job. First, it needs to have that above-mentioned reticle, and all the elevation and windage needs to be usable right to the bottom of the scope. Second, external $\frac{1}{8}$ -MOA elevation knobs need to be employed, so that extended

and quick adjustments can be made for elevation. Third, the rifle should have a beveled scope base that retains adjustments, like the military-style Leatherwood M-1200 Tactical. Leatherwood uses a system that zeros each range graduation to 1,200 meters, when high-BC .308 Win. or .50 BMG rounds are used for ultra long-range sniper or target work. This is a no-math-needed 6-24x50mm scope.



Some of the loads used during the long-range shooting of the Savage Model 10 LE in .308 Win.

With some time behind the Leupold glass and my evaluation of its shortcomings, it was time to move into a second scope. Swarovski had been good enough to send out a PVI 2 6-24x50mm L that featured a set of four hashmarks and a low light reticle. Still not a dedicated ultra long-range unit of glass, but it was a step up. After a quick zero on my home range, I sparked up the Tundra 4x4 and headed for Greg Iversen's ranch, where I'd already tested several rifles and loads for this book.

It didn't take long to lock onto a fat dog that ranged 347 yards and almost at a right angle to a building breeze. With the rifle zeroed two inches high at 200 yards, I figured the 168-grain Sierra in the Remington fodder would drop almost directly onto my 11-inch-tall gray rat. Setting up for the shot with a bag rest and shooting table, I set the crosshairs on the critter's head, pulled to the left side of the body for wind drift, and touched off the round. When the scope settled, the dog was just *gone*.



The author zeroing the .308 Win. at Hutton's ranch. Working with a portable target standard is an easy way to check proper sight alignment, when covering many miles of rough roads during hunts.

Now, by this time, I had been shooting the .308 in the Savage tack-driver enough that I had developed a shooting position in which I didn't strangle

the rifle at all, but rather let it lie loose in my arms with only two fingers closed around the folded bipod rests at the fore-end. This gave me just enough force on the rifle to allow it to roll back and settle the scope into focus by the time the bullet got to the target—I was seeing my hits even though I was shooting a heavy-caliber rifle with a heavy-weight bullet! It's yet another example of how a bigger but manageable caliber can better fight off wind, and also why the .308 Win. is a classic example of a rifle cartridge that will keep the dog shooter in the game longer than many of the sub-caliber cartridges that can't hold up in tough conditions.

Eventually, I pulled out the stops and ranged a 456-yard critter that was hanging out near a whole group of young pups. Pulling up to the first hashmark on the Swarovski glass at 12x and with a good push into the wind, the bullet cut a bit right of the dog. I sent round No. 2 into the dog lodge and took most of the right side off of it, sending that rock-slapped dog cartwheeling end over end in the process. I had been fighting the wind all the way to the target, and I'm here to tell you that no .223 Rem. or .22-250 would have been able to get the job done under those field conditions. The Savage Model 10 in .308 Win was winning my admiration, to be sure. I realize that these shots taken at prairie dogs were not world-shaking, in terms of extreme range, but, when shot in 18 to 20 mile per hour winds, these may as well have been 600- or 700-yard shots in the still morning air.

.30-06 Springfield

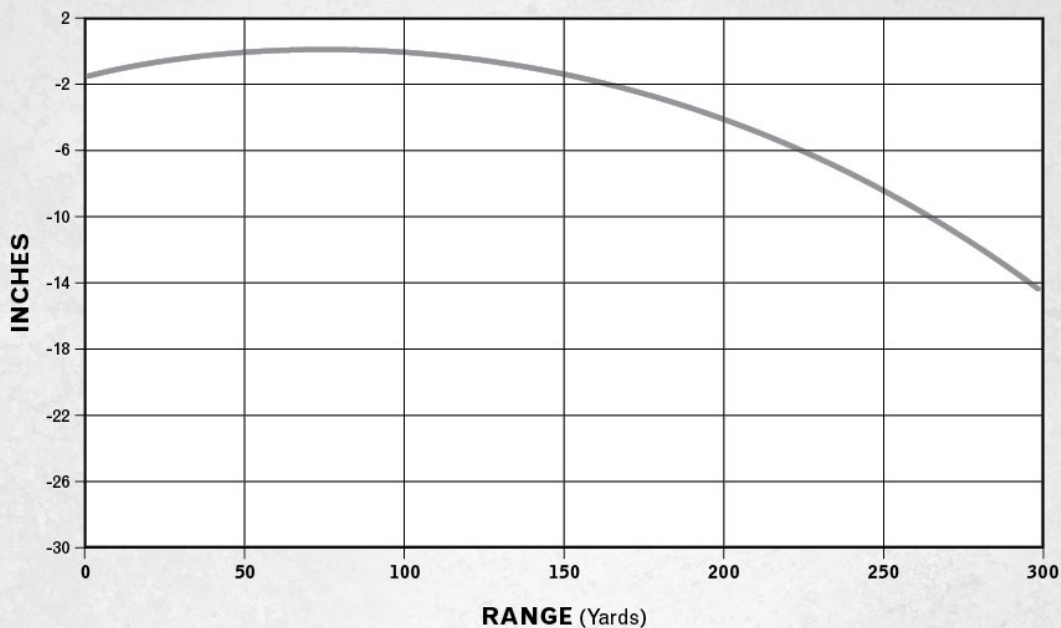
This cartridge, for you younger shooters, is the gold standard by which everything else is judged here in the USA. The '06 was our military cartridge from WWI through the Korean War, and even on to special operations well beyond that “police action” many years ago. American snipers such as Carlos N. Hathcock (the great “White Feather”), a legend among Marine snipers, preferred it for ultra long-range sniping in Vietnam,

and both military and police snipers still use it to this day. I believe more wildcat cartridges have been designed off the .30-06 case than any other. If I'm wrong, please show me, because I can't find any information that says otherwise. In my mind the good and very old 30-06 is just about perfect.

.30-06 SPRINGFIELD AVERAGE RANGE

Trajectory for a 100 yards zero with a sight height of 1.5 inches

50 Y	100 Y	200 Y	300 Y
-0.1	0	-4.0	-14.6



.300 Winchester Magnum

This is the gun that won South Dakota, at least that's what some of my local cowboys say. The .300 Win. Mag. is king out here, because it can drop elk and send bullets to 1,000 yards accurately. If I didn't shoot the .25-06 around Piedmont, my home base in this western state, my choice would be the .300 Win. Mag., it's just that versatile.

One note to consider. With the .300 Win. Mag. now designated as the long-range sniper rifle for U.S. forces, it is fitting to talk about the Black Hills Ammunitions development of a 220-grain Sierra MatchKing sniper round. At this time, Black Hills has not offered up this round to either military or civilian applications. The new configuration is outside SAAMI specs and cannot be considered safe in commercial .300 Win. Mag. rifles. Problem is, that no sooner had the buzz started about this development then shooters were asking me how to load it. Answer here is simple: No way!

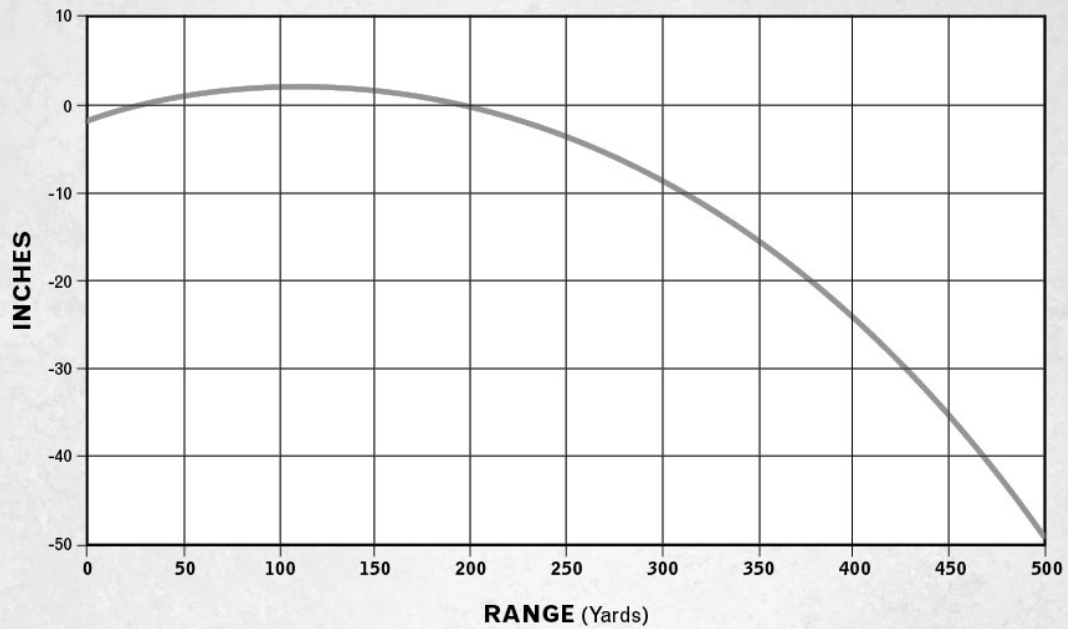
.300 AAC Blackout

I have seen a badger suck up one pile of lead and still make it into a den hole or clear out of the area using the cover of heavy brush. These critters can take a pounding and continue to rise to fight another day. But, with the level of developments in the AR-platform rifle today, we are now seeing a whole new generation of cartridges that fit the profile of badger-killing gear to the max.

.30-06 SPRINGFIELD LONG RANGE

Trajectory for a 200 yards zero with a sight height of 1.5 inches

50 Y	100 Y	200 Y	300 Y	400 Y	500 Y
0.9	2.0	0	-8.5	-24.5	-49.2



BARNES ON THE TAC-TX BLACKOUT BULLET

“We are now offering a 110-grain TAC-TX bullet that is optimized for the .300 AAC Blackout cartridge. A specially designed profile ensures flawless magazine-length loading in AR rifles. Full (.50-caliber) expansion and 20-inch plus penetration at 300 yards (tested in short and standard-length barrel rifles) provides outstanding terminal performance. All-copper construction provides consistent terminal performance through barriers. It’s an excellent choice for hunters and defense initiatives.”

TESTED: KIMBER PRO-VARMINT IN 204 RUGER				
MUZZLE	100 YARDS	200 YARDS	300 YARDS	400 YARDS
-1.5	0	-6.7	-24.0	-55.5
VELOCITY (fps)				
MUZZLE	100 YARDS	200 YARDS	300 YARDS	400 YARDS
2,350	2,070	1,810	1,574	1,369
ENERGY (ft-lbs)				
MUZZLE	100 YARDS	200 YARDS	300 YARDS	400 YARDS
1,349	1,046	800	606	N/A

[View a text version of this table](#)

THE WSSM'S: GONE BUT NOT FORGOTTEN

Though the Winchester Super Short Magnums ended up being a few flashes in the pan for many reasons, there are still plenty of guns out there and plenty of varmint shooters handloading for them. Ammo's still being made for them by most of the big ammo manufacturers, but finding it any kind of supply at your local sporting goods store is unlikely.

That's okay, though. See, when the Super Shorts were first introduced, they were the "it" rounds, and everyone had to have them. But nearly as soon as they hit the market, what really became apparent was that they were, for the most part, a handloaders dream. As an example of just how well some of the fat little rounds performed, I put together the following charts on a .223 WSSM a .243 WSSM for which I rolled my own. The .223 WSSM rounds were stuffed through a Winchester Model 70 of mine with a reworked, three-pound trigger while the .243 WSSM were pushed through a Browning A-Bolt. Together, they should give you hope if you bought one of these hot-rodded WSSM's back a few years ago and have been struggling to find ammo, and should also make it worth your while to pick up a good-condition used rifle if you stumble upon a deal.

.223 WSSM HANDLOAD PERFORMANCE

Note: 100-yard bench rest; Winchester M-70 with reworked 3-lb. trigger

BULLET	POWDER WT/GRAINS	MV (fps)	GROUP (") 3&5 SHOT	NOTE
Varmint				
Sierra Blitzking 55 gr.	Ramshot Hunter 45.3	3526	.345 (3)	Good Accuracy Load
Coyote				
Sierra 60 gr. JHP Varminter	Ramshot Hunter 46.5	3629	.378 (3)	Wind
Hornady 55 gr. V-Max	Ramshot hunter 46.7	3748	1.006 (3)	
Prairie Dogs/General				
Sierra 55 gr. Blitzking	Hodgdon Varget 40.5	3836	1.036	
Hornady 55 gr. V-Max	Hodgdon Varget 40.5	3827	.199	
Winchester 55 gr. BST	Factory		3787	.339
Sierra 55 gr. Blitzking	Ramshot Hunter 46.0	n/a	.242	Accuracy load
Hornady 55 gr. V-Max	Ramshot Hunter 46.0	n/a	.371 (3)	Accuracy load
Deer				
Sierra spitzer 65 gr. BT	Ramshot Hunter 45.0	3475	1.03	
Speer 55 gr. Trophy	Ramshot Hunter 46.0	3500	1.050	
Bonded Bear Claw				
Hornady 60 gr. SP	Ramshot Hunter 46.0	3514	1.00	

[View a text version of this table](#)

Notes: *All groups five shots unless noted. Wind zero; Temp 77° F; Elevation 5,400 feet. Chronograph: Oehler Chronotech Model 33 (Two Screen System) Groups measured center to center.

The .300 AAC Blackout is a prime example of this new direction in AR-style ordnance. With the deadly accurate 110-grain Barnes TAC-TX “dart,” as I call it, a world-class badger-busting round has indeed been created. The BC on this bullet is off the charts, thanks to its needle-pointed, ultra-long ogive. Leaving the muzzle of my Knight’s Armament/Advanced Armament Corp. (AAC) M-4 at 2,369 fps, the .30-caliber 7.62x35 round is a badger’s worst nightmare.

Based off the .221 Fireball cartridge, this squatter sister to the 7.62x39 Russian Short (of AK-47 fame), is just about a perfectly balanced cartridge against badger-sized targets at medium range limits of, say, 250 yards. While everyone is all hot about new AR-15-chambered loads for wild pigs, I can say that a badger can take more pounding and still kick your butt than any feral hog could, by a long shot.

My rifle actually sported a lower receiver from Stag Arms. The Knights Armament upper, dressed in a Delta Force, Mil Spec-style M-4 platform configuration, was then topped off with an MOA reticle Sightron 3-9x Big Sky scope. Combined, this critter control system is flat-out deadly as sin to a solid 300 yards and change. *Man*, I like this gunning setup a whole lot! While it may take some time to pile up enough dead stuff to evaluate the new .300 AAC Blackout completely, what I have dusted off so far indicates that this round wearing the Barnes bullet is going to be a winner across the board.

THE .204 RUGER: A .20-CALIBER FOR THE 21ST CENTURY

Hornady designed and built it, Ruger put the first rifle under it, and the .204 Ruger came to life as a new and very effective varmint cartridge just right for the sportsmen of the twenty-first century.

I got my first look at the .204 Ruger while prairie dog hunting with Hornady, in western Wyoming, in 2004. The rifle was a worked-over Remington Model 700 ADL in a plastic stock that had been brought to this the hunt by the Remington custom shop boys. At the time, Hornady was still taking a look at field results from the new cartridge, and very little information about it had as yet been released; other than the Ruger M77 bolt-action rifles in Mark II designs, there really wasn't much more to take afield and shoot to review the new .20-caliber. It was clear at that time, however, that Remington and a few other manufactures were serious about chambering the Ruger .204.

The .204 Ruger, an upgraded .222 Rem. case, is fast moving, the bullet going 4,000-plus fps. When I shot the very first cartridges in this new round, they were so fresh off the production line that engineers were standing around picking up the spent brass as it hit the deck—Hornady actually didn't have enough brass manufactured to meet the needs of research and development.

I found the .204 Ruger to be a very accurate cartridge from the start, enough so that it got my complete attention from my first experience with it on the bench at the 220-meter range at Pasa Park, in Quincy, Illinois. Several months after that, a package for me arrived on the local UPS truck. It was a long brown box that contained a brand new Remington Model 700 Light Varmint (LV) chambered in this nifty new cartridge. Here in South Dakota, a rifle is part and parcel of western culture, and those of us testing new works see them sink or swim based on real-world performance. This one swam. The Remington LV in the Model 700 bolt design in the .204 met my expectations right from the start.

The first place I ran this gun and cartridge through their paces was to take a crack at some local prairie dogs near my home in western South Dakota. I did a little pre-research before hitting the dog towns, with a run to the Lead, South Dakota, rifle range to do some zeroing work with both the 40-grain .204 bullet in a V-Max design and its little brother, the 32-grain V-Max. Remington had sent its Premier AccuTip cartridges in both grain weights, those bullets manufactured by Hornady for Remington and retaining a gold tip versus the orange tip found on Hornady ammunition. Is there a difference in the bullet when comparing the two? Not much, if any, as it is my understanding that all .204 Ruger ammo (except for Federal and Winchester ammunition offerings), comes directly out of Hornady.



The author shooting the first Remington non-production .204 Ruger as a hand-built test model used during the early reviews of the new round in Wyoming. Everyone knew this cartridge was going to be a big hit with varmint hunters.



Brezny shooting a Dakota Arms rifle in .204 Ruger during a Montana dog hunt. Even the upper end rifle makers were getting on board, as the .204 Ruger gained a reputation for accuracy and effectiveness afield.

Mounting a Pentax Light Seeker 4-16x scope onto a set of Weaver bases and rings on the Remington LV produced a well-balanced rig. The rifle was easy to control on the bench and retained a workable trigger. After some initial zeroing, I proceeded to shoot 100-yard groups that measured 1.044 inches for five shots, as well as .439-inch sub-MOA three-shot strings time after time. Shooting both the 32-grain and 40-grain pills produced a net zero loss of target view; there was no recoil blackout. With the 40-grain pills, the affects of wind drift are reduced greatly and, overall, the ballistics are close to what is observed when shooting the .223 Rem and a 40-grain V-Max-style spire-point bullet. On one prairie dog hunt, in fact, I pushed that first Remington 700 test rifle to almost 500 big yards with a Hornady 40-grain .204 Ruger bullet. The point here is that the .204 will do the work, if the shooter behind the rifle can dope wind, read yards, and shoot straight.

Like most new cartridges, initially all that could be had for the .204 were factory loads. Now, with recent developments from several powder manufactures and bullet offerings from Berger Bullets, Sierra, and Hornady, we are starting to see the handload possibilities associated with this hot new varmint hunter's tool. I, for one, like to work with printed, published handloading data whenever I can; it takes an element of chance and deadly surprise out of the handloading equations. Second, I like to work on my own development when I have a very solid place from which to start. While we can buy special computer programs to fill in the blanks at

times, nothing can compare to the pressure tested and chronographed results published by powder manufactures or bullet designers. Therefore, it is with that thought that I will dive headlong into some experimentation with .204 Ruger handloads. With restrictions based solely on the availability of the various components that will go into the individual handloads, and how your rifle tends to take on a given load, you should be able to duplicate and shoot much of what you read here.



The author's selection of bullets for the .204 Ruger during testing.

.204 RUGER HANDLOADS

Courtesy Ballistics Research & Development, Piedmont, South Dakota.

LOAD	BULLET/POWDER	OAL (")	MV (fps)	PRESSURE (psi)	GROUP (") @ 100 Yds.
1	Hornady V-Max 32 gr./Varget 27.0 gr.	2250	3557	38300	.535
2	Berger H.P. 35 gr./Varget 29.0 gr.	2254	3812	53100	.275
3	Hornady V-Max 40 gr./Varget 28.0 gr.	2.290	3647	55100	1.122
4	Berger H.P. 50 gr./Varget 26.0 gr.	2.300	3311	55200	.236
5	Hornady V-Max 32 gr./H335 28.3 gr.	2250	4123	54800	.299
6	Sierra Blitzking 32 gr./H335 28.3 gr.	2270	4044	N/A	.255
7	Berger H.P. 35 gr./H335 27.5	2230	3915	56600	.398
8	V-Max 40 gr./H335 26.8 gr.	2250	3738	56700	1.133

[View a text version of this table](#)



Remington's LV in .204 Ruger and Hornady V-Max factory loads. The .204 Ruger in this rifle is a nice carry option for varmint and medium long-range shooting.

.204 RUGER HANDLOADS

Courtesy Ballistics Research & Development, Piedmont, South Dakota.

Rifle: Savage Model 12, 24" barrel

LOAD	BULLET/POWDER	OAL (")	MV (fps)	PRESSURE (psi)	GROUP (") @ 100 Yds.
9	Hornady 32 gr. V-Max/IMR 30-31 25.0 gr.	2.240	3602	44.400	.884
10	Hornady 32 gr. V-Max/IMR 30-31 26.1 gr.	2.240	3793	52.800	.805
11	Hornady 40 gr. V-Max/IMR 30-31 25.6 gr.	2250	3694	56000	255*
12	Berger 50 gr./IMR 30-31 24 gr.	2.300	3284	55100	Key
13	Sierra Blitzking/32 gr. IMR 30-31 26.2 gr.	2250	3900	N/A	.275*
14	Sierra Blitzking 39 gr./IMR 30-31 25.3 gr.	2250	3600	N/A	.621
15	Sierra Blitzking 32 gr./X-Terminator 27.0 gr.	2250	4200	N/A	.276*
16	Hornady V-Max 40 gr./X-Terminator 25.0 gr.	2250	3800	N/A	.450
17	Sierra Blitzking 32 gr./TAC 29.0 gr.	2250	4100-plus**	N/A	.496
18	Hornady 32 gr. V-Max/TAC 29.0 gr.	2250	4100-plus**	N/A	.280*
19	Berger 30 gr./TAC 29.0 gr.	2250	4100-plus**	N/A	.780
20	Sierra Blitzking 32 gr./Accurate 2015 26.0 gr.	2.285	3696	N/A	.370*
21	Hornady V-Max 32 gr./Accurate 2015 26.0 gr.	2.285	3684	N/A	.679
22	Berger 30 gr./Accurate 2015 26.0 gr.	2.239	3714	N/A	.346*
23	Hornady V-Max 40 gr./Accurate 2015 25.5 gr.	2.285	3627	N/A	.772
24	Berger 35 gr./Accurate 2015 25.5 gr.	2.240	3686	N/A	.186*
25	Berger 30 gr./X-Terminator 25.0 gr.	2250	3748	N/A	.864
26	Berger 30 gr./X-Terminator 27.0 gr.	2250	3972	N/A	1.124
27	Berger 35 gr./W748 29.5 gr.	2.230	3875	55700	.279*
28	Berger 30 gr./W748 29.5 gr.	2229	3913	N/A	.313*
29	Hornady V-Max 32 gr./W748 29.5 gr.	2.290	4094	N/A	.281*
30	Berger 50 gr./W748 29.5 gr.***	2.240	2978	N/A	.327
31	Berger 40 gr./X-Terminator 25.0 gr.	2250	3872	N/A	.311*

[View a text version of this table](#)

* Accuracy loads. Under group size .300"/100 yards

** Chronograph (Chronotech Model 33 Oehler) recorded to 4100 fps (maximum upper range)

*** At 6000 feet above sea level

.204 RUGER BENCHREST TARGET RESULTS AT 100 YARDS

Group: Three shots

Rifle: Ruger M77 M II in .204 Ruger

Bullet: Hornady 32-grain V-Max

Target: 4" Caldwell Insta-View

Group #	Group (Inches)
1	.897
2	1.182
3	.587
4	.279
5	.927 (very hot barrel)

The following groups were shot after a round of 220-meter steel targets.

1	1.257
2	1.649
3	1.526

Make no mistake about it, the factory loads in .204 Ruger are good, solid products. At the time of this writing, Winchester has just introduced the new .204 Ruger load with a 34-grain jacketed hollowpoint bullet (JHP). This is a completely new hollowpoint design that will perform a new role in the .204 Ruger. Likewise, Hornady is about to turn loose a 45-grain soft-point game bullet with a thicker jacket and soft-point lead tip. Add the Federal Cartridge 39-grain Sierra to this list of advancing factory loads, and you can quickly see that the .204 Ruger is not going anywhere but up. Given all this progression, to my way of thinking, it makes very little sense to build

handloads that can't measure up to factory-rolled fodder. To date, I have taken fall gobblers to 220 yards with the 32-grain Hornady V-Max bullet, shot the new Winchester loads for 100-yard three-shot groups inside .421-inch, and rolled up prairie dogs to ranges exceeding 500 yards with the 40-grain Hornady V-Max. With all that success, the requirement in handloading must equal or exceed the factory loads and do so under a tight budget, if at all possible.



The author shooting factory 32-grain Hornady with a Kimber Pro-Varmint in Wyoming. This jack got unlucky and was caught by a .204 bullet.

In the search for load data, I locked onto Hodgdon's own Chris Hodgdon and, in no time at all, I was sitting on a stack of starter data that would serve to build my first .204 Ruger handloads. It would seem that Hodgdon had been doing its homework and was very

much ready to send out tested data for new loaders of this round. By the way, anyone can access the Hodgdon loading data for the .204 Ruger. All you need do is bring up its website, www.hodgdon.com, and take a look.



The .204 Ruger in a Ruger MK II Heavy Target/Varmint being field tested in Wyoming. This cartridge and the rifle were run through many tests prior reaching the market. On prairie dogs, it was pushed to 500-plus yards with success.

Developed from the .222 Magnum case, the .204 is a very user-friendly fuel cell in that it takes to handloading like a dream. The .204 Ruger brass case doesn't suffer from excessive brass flow during the first couple reloading cycles, and it is simple to run through sizing and bullet seating dies (in my case, the Hornady New Dimension two-die set).

Turning to Varget and H335 as propellants, I built the following handloads. What I was trying to achieve were loads that shot accurately, maintained good velocity, and didn't turn their cases into misshapen metal stumps with blown-out primer pockets.

The selected rifle for these handloading tables was the Savage Model 12 Low Profile. This heavy target model features Savage's AccuTrigger and was mounted with a large, 30mm varmint/target Pentax Lightseeker scope. Using the new Caldwell benchrest, tried to pull everything possible from the handloaded fodder to 100 yards on a warm, slightly breezy morning. Elevation at my range was more than 5,000 feet, giving me some added edge in terms of a lower bullet resistance and drag.

Regardless the wind, elevation, or whatever, the Savage Model 12 shot the first batch of handloaded rounds beautifully. I simply could not have asked for more from both rifle and loads. Right out of the gate I had good velocity, no pressure signs at all, and accuracy. That made for a very happy handloader, and I believe it is because of a very well-designed varmint cartridge and rifle.

In my early accuracy load development, the Berger 50-grain hollowpint ahead of 26.0 grains of Varget was a clear winner. Why? This 50-grain pill requires a 1:8 twist to stabilize well, and the Savage Model 12 retains a 1:12 twist that is best suited to lighter bullets. Well, it would seem that shooting at 5,000 feet above sea level, and at a temperature of 70 degrees, a uniformly fast load of 3,311 fps had this bullet run true all the way to the 100-yard target.

That was good performance, to be sure, but, in truth, and as you will see a bit later, the 50-grain Berger is better suited to a fast-twist bore. When tested at a bit lower altitude with a different powder and

less velocity (load No.12 in the chart on page 64), that bullet came in key-holing on its side at 100 yards. If you need to shoot the 50-grain Berger, shoot it fast at high temperature and well above sea level. If you don't have that combination of conditions, forget it and find a different load.



A variety of powders were used when building new loads on the handloading bench for the .204 Ruger. This cartridge is flexible, although it has only been around a few years.

When it came time to turn up the heat, the No. 6 load appearing in the chart is a Sierra BlitzKing 32-grain, pushing along at 4,044 fps and cutting .255-inch holes in the 100-yard target backer, a clear winner. This is a prairie dog killer bar none, and I'm loading a pile for field work on the next dog hunt I take.

With Chris Hodgdon helping on his end at Hodgdon Powders, I was soon presented with a list of IMR powders that had been found workable in the .204 Ruger. While I didn't have much IMR powder in

my inventory, I did have a can of IMR 3031 at the loading bench, and that would serve as a starter load. Along with the IMR load, I also retained an array of Accurate powders, and these would be an additional strong element in load design. My test loads were not exactly part of book-published data, as Accurate propellants and others had not, at that time, been fitted around the .204 Ruger cartridge. However, my starting and high end loads would be “advised” loads by engineers at Accurate/Ramshot and Sierra bullets and, as such, serve as a good base when working up loads with several different powders. Also, because of this work with Accurate and Sierra, I would select some varied recipes from data supplied by Sierra for its new BlitzKing 32-grain and 39-grain bullets in .204. Sierra had already shipped the loaded H335-pushed 32-grain BlitzKing pills that had produced some very positive results, but now the 32-grain and the recently arrived 39-grain bullets would be driven by IMR 3031.

As an additional offering, the X-Terminator and TAC propellants from Ramshot would also be tested. I found the X-Terminator to be a fine-grained, ball-type propellant that retained a very smooth flow when loaded from my Redding measure, and it compressed well in this short-necked, small-diameter case. X-terminator powder would be a winner at the loading bench, if it could produce good results downrange.

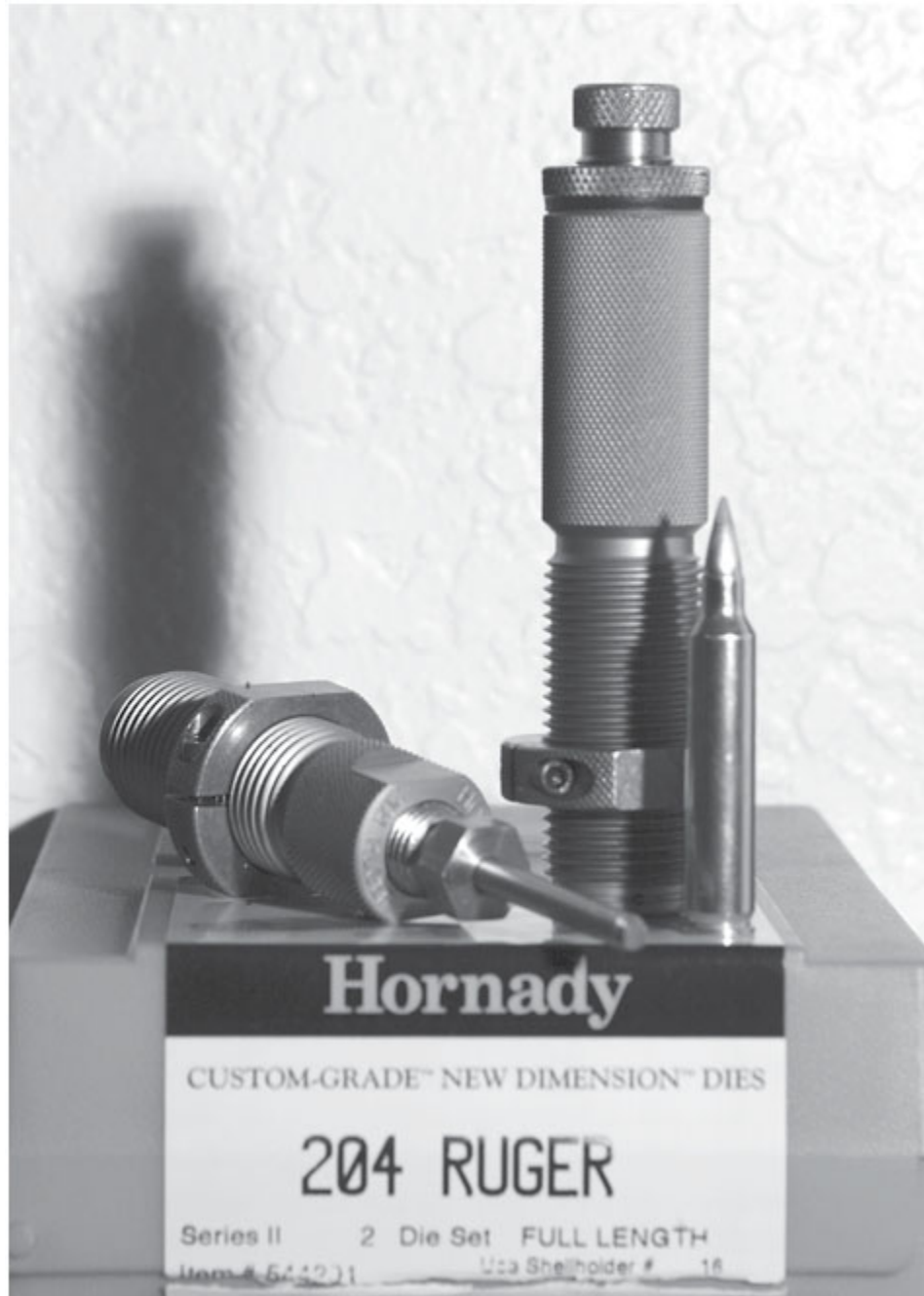
I guess I got lucky, as the .204 Ruger was unfolding across the industry, in that I was quickly offered four class-act rifles chambered in the new cartridge. First off was the Savage Model 12 Low Profile, weighing in at almost 11 pounds. This heavy varmint mounted Weaver bases and rings and a varmint-style Pentax Lightseeker 30

in a 6-24x magnification for my testing. Loaded, this rifle is a handful, and I selected it as the bench rifle for all of my handload testing, to give every batch of ammo the same level playing field when it came to shooting groups on paper. The second rifle in the battery was that previously discussed Remington LV, or Light Varmint. The third rifle came to me by way of a hunt with Browning and their marketing guy Scott Grange, who was good enough to ship out the Browning A-Bolt in a Stalker configuration. I had shot the A-Bolt in a Grade II Browning during a different hunt with these folks and, after plastering groups less than ½-MOA at 100 yards, I was sold on this addition to my test base. Mounting Burris rings and bases and a Ramshot 6-16x varmint scope in a 30mm tube, the Browning A-Bolt was up and ready to tackle paper targets, or whatever came its way afield. As a final .204 Ruger rifle, the Kimber 84-M in the Pro Varmint version got the call. This field rifle would see a great deal of work, as it shot as well as the heavy-barreled Savage Model 12 right out of the box, retained a very good loaded field carry weight of under six pounds, and balanced between the hands for running or off-hand shots like a dream. The Kimber rifle mounted the Kimber “turn-in” bases and rings, then locked down a BSA 6-16x scope with an on-demand and rheostat-controlled lighted reticle; the BSA isn’t a high-dollar optic, but it had dusted no less than a pair of 200-plus-yard long-range gobblers (over a 32-grain Hornady .204), and hit both right at the spine, leaving no meat damage whatsoever. With a very crisp three-pound trigger that compared to Savage’s AccuTrigger, the Kimber made a good showing of itself.

After several trips to the range, a complete picture started to develop around the .204 Ruger as home-rolled fodder. In general,

the 30- through 34-grain bullets did the best, in terms of some truly tack-driving accuracy through the 1:12 twist Savage heavy varmint rifle. Some of the groups were so good at 100 yards that I believe they would have won a benchrest competition.

As I reviewed these many test loads for inclusion in this book, several thoughts come to mind. These include:



Hornady dies in .204 did much of the work in handloading test fodder for the new rifles.

- Thanks to Rick Jamison, a shooting editor at *Shooting Times* magazine, I was able to get a headstart on this work with W748, a powder I keep on hand because it is accurate and easy to work with. Shooting the 32-grain V-Max bullet behind load No. 29 in the chart,

which was developed by Rick, will surely find itself being handloaded in quantity, as I take on prairie dogs this coming spring.

- The 30-grain Berger was not always the top bullet in accuracy, but load No. 28 in W748, and load No. 19 pushed by TAC, are also going to see summer work. I like this little fast-mover, and it intrigues me a great deal. The 30-grain Berger bullets move off the muzzle fast and are reduced to dust against even very soft targets. I think a twist rate of about 1:14 would push this blistering bullet to a better level of accuracy. On the other hand, in the Savage Model 12, darn few prairie dogs ever get past its muzzle in one piece.
- For the most part, every powder tested turned loose at least one great accuracy load. I would have to say that the .204 Ruger is a cinch for producing good accuracy (keeping in mind that a good rifle is also a part of the equation).
- While almost all loads tended to group at the same general point of impact, there were some changes in horizontal line that dictate that close attention should be given to paper zero checks prior to taking any .204 Ruger handload afield for the hunt. This is not the good old .30-06 Springfield or .223 Rem. that can be a group shooter's dream across a variety of bullet brands and weights.
- In all cases, I ran my Oehler Chronotech Model 33 right alongside published velocity data. With my screens set four feet from the rifle's muzzle, my velocities were always a bit lower than published data, which is taken at the muzzle. Also, as indicated with loads No. 17, 18, and 19, my equipment would not record the velocities, as they exceeded the limits of my old tried and true two-screen system (above 4,100 fps). Just how fast will the .204 Ruger push a bullet? That question is up for grabs. I didn't stress the round or take any chances

with my loading methods. A velocity of 4,100 fps is enough for this prairie dog shooter. I think that these three loads were all moving well above 4,200 fps. That's just a guess, but, either way you slice it, those bullets got downrange very, very quickly.

I think I should clarify at this time that in no way would I abandon the .204 Ruger factory loads. While I was indeed making an effort to introduce the .204 to the handloader, I realize that not every varmint hunter is a prairie dog shooter who wants to spend time on the reloading bench. No one should be left out of the new world of the .204 Ruger, as this little fast-mover is just too much fun for that to happen.

As I have previously indicated, I have shot all the current factory packages in .204 Ruger ammunition. With the Remington offerings in both 32- and 40-grain V-Max bullets (and, yes, as I've explained, these are Hornady V-Max designed bullets with the Remington Accu-Tip label attached to them), I succeeded in dusting turkeys, prairie dogs, badgers, and coyotes. I have learned through those gunned critters that the "V" bullets are top-end performers. Winchester's new 34-grain JHP loads have also performed well. During testing of the .204 Ruger bullets, static shooting against sections of butchered whitetail deer and shot jack rabbits were used to gain visual information on the amount of damage bullets of different weights would inflict on small to large targets. I found that the .204 Ruger, loaded with everything from 30-grain Berger bullets to 40-grain V-Max or JHP Berger pills, can be effective on even large coyotes, if some attention is paid to range. For example, the .204 30- and 32-grain bullets in V-Max or JHP designs all produced good wound channels to 150 yards, even when deer rib sections or heavier neck

areas were used for penetration test shooting. If even a 30-grain super-lightweight bullet hit bone, there was substantial tissue damage inasmuch as the velocity of this bullet at 100 yards (3,500 fps) is still very high and, so, quite devastating. Coyote hunters should take note.



Brezny, left, and partner Ron Spomer, noted outdoor writer, with prairie-gunned gobblers taken over a two-day period. The author's birds were harvested with a Kimber Pro-Varmint in .204 Ruger. Ron shot his birds with a scattergun.



Brezny rolling home from a jack hunt. The .204 Ruger was used on many jackrabbit forays with great success.

Notice that I have given no attention here to ultra long-range shooting with light bullets. Why? I don't believe the .204 Ruger is an ultra long-range rifle cartridge. But that doesn't mean you're limited to 50- and 100-yard distances. Keep coyote shots to less than 300 yards, better yet inside 200 yards, and you're home-free with this sub-sized centerfire varmint tool. What I'm getting at is that these are long-range shots for a caliber and bullet of this size. For really exacting performance on coyotes with the .204 Ruger, you really should shift to the 40-grain bullets in the Berger or Hornady V-Max designs, or the new Hornady 45-grain soft-point designed to hold together on larger animals, especially if shots are taken to extended range limits. (The Berger pills, at this time, are a handloading option only.) To date, the coyotes I have gunned with the .204 Ruger have returned good examples of measured bullet behavior. Exit wounds have been nonexistent so far, but be advised that, as a lightweight .20-caliber pill, the .204 will shed velocity quickly beyond 300 yards. This is why pushing range beyond the what I've just talked about will result in less than effective bullet performance (and you don't want to do that to a coyote, whether you love 'em or hate 'em).



John Anderson, editor of *The Varmint Hunter Magazine*, with an author-called Wyoming coyote taken at 70 yards with the .204 Ruger. Keep range short for the best results on larger critters

like these, while longer distances can be had with prairie dogs and ground squirrels.

CHAPTER 3

RIFLE BASICS

IT WAS LATE WINTER up near the Black Hills of South Dakota, and I had been winding down my coyote calling season with a few local hunts early each morning along the Box Elder Creek east of Rapid City. On one of these hunts, an exceptionally cold morning for late-season hunting that came with a fresh, four-inch snowfall on the ground, I was able to make some accurate checks of coyote sign, as I slowly drove the two-track that headed into some low buttes and rolling buffalo grass hills. I could see that coyotes had been active the night before, as my headlight bounced off song dog tracks crossing my trail every several hundred yards or so.

Packed in my 4x4 was a new rifle that had been somewhat of an adventure putting together. The cartridge was my old favorite .25-06 Remington. Known for many years around the time of WWII as a wildcat configuration, it was necked down from an '06 case. In fact, making the round was easy. All I had to do was neck-size a .30-06 case once through the .25-06 die; my set of .25-06 RCBS dies were flawless in their ability to keep all the correct dimensions in line each and every round. As for the gun, I'd started my build by assessing two rifles from which I'd intended to scavenge barrel and action, having those pieces installed in a new stock platform built by a local Rapid City company, Accurate Innovations, Inc. Out of the two, the rifle action I settled on was taken from a new Remington Model 700 Classic. The factory rifle had a 24-inch barrel

needed for the big-burn .25-caliber, and the trigger was darn good for a factory product right out of the packing box. This rifle shot sub- $\frac{3}{4}$ -MOA with a green barrel, and I figured by restocking the barreled action in Accurate Innovations' laminated bamboo stock and its special bedding system, I could shave off at least a quarter-inch at 100 yards from those early test groups.



A long-range coyote kill via the author's .25-06. This South Dakota rifle by Accurate Innovations was designed for long-range work.

Reaching a cross track, I turned east, paralleling the path the coyotes had taken. I drove another two miles along and then came to a stop with my truck masked by a single large butte. This was crunch time, and with a camo white-and-black Cabela's coverall and a camo face mask on, and a set of shooting sticks and calls in hand, I headed along the lower end of the butte. Moving in the direction I thought I would provide me a setup up to call and intercept the coyotes, I began a search for a good calling hide.

Rounding the base of the big hill, I caught sight of a male dog, his head down and his nose cutting a track in the fresh snow. I slowly dropped down and set my rifle across my shooting sticks. The fore-end of my rifle wasn't very wide, rather in the style of its former, classically cut stock it had originally come with from the Remington factory. With the bamboo being very dense and among the strongest wood known to man, the seven-pound rifle was a bit front heavy, but that's an advantage when resting on sticks.



Accuracy is everything in long-range shooting. You need all the edge you can get when bullets are pushing past 400 yards. Here the .243 Winchester in the author's Remington VS Model 700 drilled ½-MOA groups to 100 yards.

About the time I got set for a shot at the big male coyote, a second dog emerged from out of the dry creek bed. This was a gyp (female coyote) and she was crouching low, about 100 to 125 yards closer to me than her partner. I turned the muzzle toward the female and, with the crosshairs of my Cabela's Premium 6-20x40mm scope set directly on her vitals for a clean side shot, I sent the 87-grain bullet from my handload in her direction.

The gyp had been at about 325 yards. I'd made a quick assessment of her distance using a gap, or visual space distance, method of ranging, a technique that's simple and quite effective to about 400 yards. What I had not done, however, was to allow for my bullet going high. I was shooting at a sharp angle downhill and, consequently, the shot skipped an inch or two over her back.

At the shot, the gyp hauled tail for a big flat and some heavy brush on the far side of the creek. The male was running for it, too. At the point both dogs dropped into the heavy brush, about 1,500 yards downrange, I turned to my FoxPro caller and broadcast a young dog in distress. *Waa, wa, wa*, droned the electric calling unit. To my complete surprise, the gyp came running around a butte a full 500 to 800 yards east of me, and then came to a stop at almost my exact elevation. She stopped, turned, and then sat down looking straight at me. This was too much to expect of a willing target, but good luck for me.

Resetting my sticks, I put my crosshairs right between the old girl's ears. I figured the shot to be 425 yards, again using my quick gap ranging technique. The rifle felt like home, the scope was as clear as new ice, and now trigger control was what this morning was all about. When it broke free, the .25-06 snapped, but, with the light 87-grain Sierra Varminter hollowpoint, the low recoil allowed me to watch the gyp get hit and roll like a bowling pin back on her rear end. She gave a couple of kicks with her legs straight in the air and then everything went dead still again on that cold, snow-covered hillside. The male had watched the entire event from above her, and if I had been able to get my muzzle elevated a second or two earlier, I believe he would have been walking wherever dead coyotes go for sure. Alas, he disappeared at the crack of my second shot.

This shooting rig was the latest in my quest for the ideal long-range rifle for use where I hunt in South Dakota. The .25-06 has range, balance, accuracy, and energy as a hair-on killer to 400 yards, with a real edge well out to 600 yards, when required. But, what about 1,000-yard work? Well, that's another story, and yet to come. In the meantime, let's cover the rifle actions available for this work and some of the pros and cons of each.

BOLT-ACTIONS

My first choice in a long-range rifle action has to be the old turn-bolt rifle. This action is as simple as field dirt and tough as a prizefighter. Turn-bolts require little maintenance, feed well even in extreme field conditions, and lock down a cartridge squarely in the chamber. Accuracy with this action is deadly, when a tuned rifle has been put together either by a factory that does its builds with an eye toward quality, and certainly with one built by a competent custom gunsmith.

Designed either as a repeater using a box magazine or as a loading-plate single-shot, these are deadly killing machines to be sure. Selection of brands and features goes on nearly endlessly when selecting the turn-bolt rifle, and the prices range accordingly, from those as reasonable as the low \$500s certainly up to thousands of dollars, depending on maker and custom additions.

HINGED/FALLING BLOCK

The hinged falling block or fixed breechblock designs like those found in the famous Sharps buffalo rifle have been carried down into the Ruger No. 1 and Winchester High Wall 1885 models, to name just a couple. Single-shot rifles can be very accurate, easy to maintain, and very safe to use by beginning sport shooters.

If one of those in this action genre seems to have any problems it is the Ruger single-shot. I find bullet impact tends to climb from this rifle, as the barrel warms up; the issue has plagued me over the many years I have shot the Ruger single-shot. Special barrel bed reworking of these No. 1 rifles can reduce this problem. Then again, the problem doesn't happen with all of them. Cold, they also seem to be fine; my 7mm Remington Magnum is none other than a Ruger one-shot breechloader. With that gun and a cold barrel, I have seldom, if ever, missed a mule deer or goat with the rifle. Today, it is equipped with a massive 10-40x50mm Tasco ultra-high magnification scope expressly set up for 600-plus-yard prairie dogs. There was also a time when I shot the big rifle as backup to East Coast greenhorns hunting Western states for deer; more than once the "Big Seven" dropped a wounded deer that was about to dive off into a deep draw and a long, long tracking job.



Here the bolt action is king. Zero work in Texas prior to a coyote hunt. The rifle is a Savage Model 16 in .223 Remington. A good choice for covering shots under 400 yards when gunning Texas two-track trails.

AUTOLOADERS

Third on the list of long-range rifle actions are the semi-autos. These use spent barrel gasses to generate energy that activates the rifle's bolt system. The gas-activated autoloader in its semi-auto mode can be an effective source of firepower. What you must ask with these actions is, is it worth possibly giving up some dependability to gain more rounds downrange in less time?

If you're thinking that the newer autos can't deliver the mail, please reconsider. Except for the fact that the autoloader, with few exceptions, doesn't chamber very heavy cartridges, today's new semi-autos are deadly tools.

Let's take a detailed look at the Les Baer rifles, as an example. I selected this AR-type platform because, in my experience, they are the cream of the crop, in terms of dependability and accuracy. Les Baer AR rifles are hand-built except for the stock and trigger, meaning every part is manufactured in-house and then hand-fitted to each custom rifle. My Custom Ultimate AR .223 (or just "Super Varmint"), I shoot from bag rests and, in most cases, it doesn't miss a beat.

Out for a day of coyote shooting with my new Super Varmint, I sighted a ridge that contained 11 nice, adult coyotes, all arranged in a neat, staggered line against its gradual slope. With my tech assistant from the Les Baer rifle company alongside and passing me the first 30-round magazine full of Winchester 55-grain "Silver Death" Ballistic Silver Tip bullets, I dropped the Leupold VX-III 4.5-14x Mil Dot crosshairs on dog No. 1 at a ranged 300 yards and then proceeded to clean out the rest of the group. The total number of targets hit from the now-warm barrel was nine, with a single miss for the record. That missed dog was quickly followed up by way of a very fast second shot, all while observing a sight picture that never faded, thanks to the gun's low recoil. This gun platform certainly got my attention, enough that I would never view the autoloader as a varmint hunting rig poorly again.



This is a custom, heavy long-range rifle that commands a custom barrel, stock and action. You can bet that the trigger is first class and in general this is a gun system designed for ultra-long-range work at 600-plus yards.

Shooting the varmint-specific AR was not about to turn me from my bolt guns, but I was gaining a real respect for just what the AR is capable of, when machined into tight mechanical systems. I was told that my test Les Baer rifle had actually been used on a series of hunts and, in fact, had digested better than 1,300 rounds before I'd ever touched it! Even so, the gun hadn't lost a single bit of accuracy. I wondered about that, but then I learned that, when buying a Les Baer rifle, you can be assured that each one has been inspected by Les himself and personally benchrest tested. If the rifle won't shoot sub-MOA (under one inch at 100 yards), it goes back to the shop. The evidence of that attention to detail—those 10 dead coyotes—paid testament to that.

Later, stretching the AR's range to better than 400 yards presented no problem and, with some dedicated time behind the gun, I was able to push

one-shot (first-round) kills to almost 500 yards. Confidence up, a friend and I pressed it into service, shooting down into a deep-green short-grass basin that contained almost black prairie dogs that, if larger, could have been mistaken for rockchucks. At a range of 400 to 500 yards, these fur balls were not at all aware of us on that ridge, and, during the better part of an hour, we managed to make a series of very long-range kills.

I'm sure you're now thinking, "Great, those autoloaders were getting the job done, but maintaining them in the hot dusty conditions of central Wyoming must have been a real pain, right?" The fact of the matter is that, in terms of maintenance, the gun received a blast of Break Free lube at mid-day directly into the bolt assembly, and that was the end of any special care whatsoever. By day's end, the rifles were taken down by separating the top ends from the lower, then a swab was run through the bore and the actions were wiped down. That simplicity reminded me of the pain of having to dump full quart cans of motor oil over the receivers of .50-caliber machine guns during high-stress firing tests. Quite a difference.

As good as the AR platform is and as valuable as their fast follow-up shot capability can be, you still need to ask the question of yourself: Do you need all that bullet dispensing ability or the price tag that goes with it?

The example I've just given you concerned my time with a Les Baer Custom Varmint AR .223 or Super Varmint. In truth, Les Baer offers a varied line of AR guns that include a very nice AR .223 M4 Flattop (civilian model), a Super Match custom in .223, a .223 Action IPSC, a Custom CMP Competition, and a tricked-out Custom NRA Match version. And those are just the .223 models! Currently, Les Baer also offers his ARs in a .204 Ruger Custom Ultimate, a model chambered for Les' own .264 LBC-AR cartridge, Super Varmint and M4 Flattop models in 6x45, and several more models, both S.W.A.T. and long-range, chambered in .308.



Thompson/Center's Contender in .22 Hornet as owned by the author is a classic example of a modern hinged-action rifle. These rifles are accurate and simple to maintain and shoot.



The Les Baer Super Varmint AR-15 in the Big Horn mountains during a long-range coyote hunt.



The author zeroing the Super Varmint prior to taking it afield.

With all the parts of the rifle machined as a matched set, the Baer ARs are built on a custom ordered basis, and, if you're interested in owning one of these gas gun masterpieces, it will take up to 16 weeks to bring all the elements of your one-of-a kind-rifle together. Each upper and lower are hand-fitted after being totally manufactured in-house.

I feel I need to say something, at this point, about some of my past feelings about the use of autoloading firearms for varmint hunting. As a police officer of 23 years, I shot autos more times than I care to remember. In all cases, these guns were designed and trained with as man-killers, period, and that is how I came to understand them. We shot "Hot House" entry scenarios in training that included "spray and pray" techniques, often dumping select-fire rounds into J-100 FBI targets at close range all day long. Sniper units were, and still are, issued M24 style Remington Model

700s in .308 (7.62), so the fine shooting work was left to the turn-bolt crew. The bottom line was that AR-type firearms were relegated to the urban battlefield or against a standing army, and turn-bolts and single-shot break-open guns were the tools of the long-range shooters.

After the Wyoming AR event, I changed my mind about the value of the auto-loading rifle as a coyote caller's gun, and even as a long-range PD/coyote eliminating tool. Gun systems like the Les Baer are classed well within the upper limits of quality firearms and, in fact, do produce the field results that match their quality and price tag. These rifles are not cheap, to be sure; getting into an AR of this quality will run you the better part of \$3,000, and that figure is not set in stone by any means. Recently, I talked with a varmint hunter who sold off several older turn-bolts and went to the AR-style rifle. He could not have been more pleased with that choice. But would I do that same thing? Not without hanging on to a number of quality bolt guns. I guess I'm just not quite there yet.



The gas rifle is soft on recoil and easy to shoot from prone and any other basic position.

FACTORY OR CUSTOM-BUILT RIFLES?

With the use of laser-guided milling, space-age materials, and the introduction of some solid engineering, the modern factory rifle is truly a real bargain. I have always stated that the rifles built by Savage, Browning, Ruger, Remington, CZ, and others today are so far advanced over the custom rifles I shot years ago, that there is absolutely no valid comparison. Want an old-school custom rifle? Buy a modern, out-of-the-box, factory-tuned shooting tool, where you'll get a whole lot of bang for the buck.

In reviewing the current battery of rifles that are, to my way of thinking, affordable and outstanding examples of engineering, by sheer numbers there is no way that I can touch upon them all. The market today is just too

vast. But, by taking into account the brands of rifles and their appointments I will address here, you can put together one of these suggested gun systems or another that retains some of my suggested options. If money is no object, I would suggest contacting the people at Rifles, Inc. This Texas rifle builder specializes in custom lightweight rifles. With rifles built to your own personal fit and requirements, this gun maker source is a good buy in the upper end custom department.



Berry's rifle being shot on the range. Full auto was even easy to control with the use of the suppressed quiet shooting gun system on the muzzle.

Again, in the custom-built department, the rifles offered by H-S Precision, of Rapid City, South Dakota, are second to none. Being turn-bolt designs, these rifles are manufactured one at a time, with all American labor and parts. That's big news, nowadays. I have shot H-S rifles extensively, and each has exhibited nothing less than dead-on perfect results. Tack a Leupold varmint target scope to a .308 or .22-250, and it's time to get tough on prairie dogs or whatever crosses those sights. H-S Precision builds rifles

that will chamber any standard SAAMI cartridge. Thirty-caliber cartridges will all shoot sub-MOA, and larger cartridges are guaranteed to shoot at least 1 MOA at 100 yards. Each rifle is proof fired, and a physical target accompanies each new rifle.

Currently, H-S Precision builds its handmade rifles for U.S. Government agencies, police departments, professional contractors working on foreign soil, and you, the long-range shooting sportsmen. Shoot anything from a .223 Rem to the .300 Win. Mag., and H-S can build a gun system for you.

In a custom rifle, you're going to get precise manufacturing methods and always very good accuracy. If not, the rifle goes back. I was informed by Todd Boughton, Vice President of H-S Precision, that there have been times when the customer had been taken right to the test tunnel after informing Tom that his rifle would not shoot groups. In every case to date, the fault has been that of the guy behind the rifle. H-S rifles and many other customs will outshoot most riflemen. Keep that in mind, if your groups look a bit shabby with that new high-end shooting stick.

At a drop-in price, but still a high-end rifle, the Browning A-Bolt has been around for some time and is offered in several different weight and stock configurations, as well as a variety of chamberings. I shot the A-Bolt in .223 WSSM during its early test trials with Browning/Winchester, in Texas, on 'yotes, and I will tell you that this cartridge in the A-Bolt or any good rifle is going to be a secret favorite of many, just as the .220 Swift was once upon a time. While I don't believe the A-Bolt is as fast an action as, say, the Kimber, the Remington Model 700, or the Winchester Model 70, it is a reliable turn-bolt system that has great fit, smooth function, and is well-detailed in terms of wood to steel fit.



Berry Dueck on staff with Surefire shooting a tricked-up variant of the AR-15 Super Varmint. This is a military model of the Les Baer rifle and similar to those in current use throughout the Middle East by special operations troops (including full-auto selector).

Offered by Beretta, the Tikka, from Finland, is a deadly tool in its tactical, or varmint variation. I shoot this rifle in .223 Rem as a tactical design, but it is offered in the .308 Winchester as well. Believe me, this rifle is as close to custom as possible without ordering one out of a specialty shop. Priced at about \$1,500, the T-3 retains a special pillar-bedded action, a heavy muzzle brake on a short 22-inch heavy barrel, fully adjustable comb, detachable box magazine, and an outstanding trigger/barrel combination that will drive one-hole groups with good ammo to 100 yards. In .308/7.62, this is a solid 600-yard rifle.

If I let the cat out of the bag at all, it is merely to say that, more often than not, I have recommended none other than a Savage 110 action with a synthetic target stock and medium heavy barrel chambered at least in .22-250 to first-time buyers of long-range rifles. In time, a move to the heavyweights in .30-caliber is advisable, but this requires a detailed

learning curve. Don't just jump off the deep end if you're just starting out in the long-range game.

CHAPTER 4

HEAVY HITTERS: THE NEW CROP

IT'S CALLED THE "REMINGTON Modular Sniper Rifle," model designation XM2010. Another name I made for this ultra high-grade, long-range military rifle is the "space gun." Whatever you call it, it's made to go long. With the move to the .300 Win. Mag. by all service branches of late, largely because of the experiences of snipers in Afghanistan, the 1,000-yard baseline sniper rifle has been reevaluated and revamped to make an additional 500-yard requirement, for a total effectiveness to 1,500 yards (and sometimes more). The Remington MSR isn't the only one making this grade. Part of this upward shift in technology is because the U.S. Military is pressing a new SOCOM Precision Sniper Rifle requirement that will take the U.S. Army well into the twenty-first century. It is valuable to note this transition in long-range performance firearms and ammunition, because, as is nearly always the case, what works for the Army or Marine sniper will be next in line for the civilian competition marksmen, varmint hunters, and other long-range enthusiasts.

It's with these thoughts that I bring you the current batch of heavy hitters in long-range rifles at this juncture, because they illustrate just how much we have moved off center since I wrote the first edition. Let's dig in and take a look at the crop of guns kicking butt and taking names.



Remington Defense Sniper Rifle. This could be the very best long-range rifle ever built to date?
(Photo courtesy Remington Arms)



The author (right) bench shooting a suppressed Remington XM2010 during 1,000-yard testing with friends.

REMINGTON'S XM2010

I started with that little bit about the Remington “space gun,” because it is what I consider the best of the best and a prime example of how a project based on long-range sniper experience in live combat has resulted in Remington now offering for SOCOM consideration one hell of a ultra long-range shooting iron. The XM2010, as it came to me for evaluation, is a modular rifle that can be taken down and turned from a .338 Lapua to a .300 Winchester or a .308 in short order. A barrel switch (in three different lengths), a bolt change, and you're up and running with a completely new rifle.

With an X-Mark Pro adjustable trigger (user friendly) a bottom-up folding buttstock design, and quick-mount suppressor mount, the rifle is 100-percent patent-applied for all the working surfaces—that's how unique this gun is. Everything in the design is totally new and proprietary to Remington Arms. This is a major move by the gun builder and a whole lot is hanging on the line, in terms of the SOCOM military contracts.

What this rifle does for shooters outside a sniper's hide in some Middle East rock pile is offer brand new ideas for other ultra long-range rifle design. Note I have indicated “ultra” long range, because I feel that, after passing the 1,000-yard mark, you've entered a whole new realm of rifle, ammunition, and optic technologies, as well as that of shooting skills.

Going Hot

On a warm summer day, one almost without wind, the new Remington XM2010 went to war against long-range steel targets. Though not available to the public at this time, the rifle wore a Horus reticle Leupold 6.5-20x50mm M-6 scope with a 35mm tube. It is a sniper's scope, one developed expressly for military service. I was lacking any information on how to use the reticle, so I gave it a guess, gauging the half and full Mil Dot

hash marks against a 600-yard steel gong. Talking with a young cowboy, a local hunter I know named Andrew Snyder, we decided that, based on other long-range shooting we'd done, that the bullet drop for the .300 Win. Mag. should be about 32 inches at that distance, given a zero at 200 yards. At that degree of drop, the bullet would impact at about the scope's No. 2 full hashmark (2 Mils), and, with an added two short hashmarks ($\frac{2}{10}$ -Mil) about a third of the way to the No. 3 full (3 Mils) line, the bullet should drop in or very close to target center.



The author at the 1,500-yard steel target. This is maximum-range work for the new XM2010 in .300 Win. Mag.

With my friends Wayne Bremer and Tom Hanson on spotting scopes, I chambered a round of Russian-manufactured 150-grain ammo as a first tracking shot. At the shot, the round fell about three feet short, so I put an additional two short hash marks ($\frac{4}{10}$ -Mil) of elevation. The next round

slapped the steel plate four inches low of center; my bit of guesswork and one low round as a splat indicator had been enough to put bullets on steel right from the get-go, pretty good for a new gun and scope combination. I noted the calculations for these two 600-yard shots and recorded them on my range card for the day's work.

After putting bullets on steel, I took the gun to our local club range for its next set of tests. It was a holiday, and several other shooters had been setting up to zero antelope and deer rifles for the upcoming season. Pretty normal comings and goings for our range, but, when I had hauled out the 17-pound Remington, everything came to a stop. Promptly I was afforded a benchrest, and an audience of sorts gathered round me as I re-checked the 600-yard impact point. Again, keep in mind that I had not had any training on the unusual and complex Horus reticle, rather I was relying strictly on my own skill sets and 55 years of long-range shooting behind lots of other glass.



A young friend of Brezny's, cowboy Andrew Snyder, is over the rifle in this shot, taking on 600-yard steel targets. He produced first-shot kills on each and every shot.

After getting a few bullets on steel, everyone wanted to take a crack at the 600-yard gong. I was happy to oblige, so, with my camera ready and two spotters beside me, I proceeded to set fresh shooters at the rifle, each with two rounds of the low-budget Russian ammo. Despite its looks, the gun is nothing more than an everyday turn-bolt, save for the fact that the extractor only pulls the spent case to the follower plate, which allows the shooter to pluck it out of the action. It's really a dirt-simple gun. I gave each shooter easy scoping directions; hold at 2 Mils, then $\frac{4}{10}$ -Mil below that on the reticle's scale and take your shot. All but one of nine shooters made a first round centered hit on the 600-yard steel gong. The one who missed, a 13-year-old boy, sent his bullet to the base of the steel and it bounced into it, returning a loud slap. We gave him the hit and at that point, and you could not get the smile off his young face.

Once everyone had a chance at the gun, the conversation started, and the element the crowd could not talk about enough was the fact that the rifle, equipped with the Advanced Armament Corporation suppressor, had nearly no report! There was just a dull hiss followed by a very light thump—I've shot airguns that were louder! Of course, it should follow that there was also no recoil. I don't mean that there was simply a little or recoil that was comfortable to work with, I mean there was *none at all*. A sniper in combat could shoot this rifle all day long and never feel recoil fatigue. Indeed, it could well be the final answer to gaining confidence behind a very high-powered rifle.

SHOTdata: 09-09-2013

Projectile: .300 Win. Mag., 150-grain Barnes TTSX boat-tail

Drag Function: G1

Standard Atmosphere: 59-degrees F.; 29.53 inHG @ sea level.

Standard BC: 0.420

Sight over boreline: 2 inches

Zero range: 1,000

Crosswind: 10 miles per hour

RANGE (Yards)	IMPACT (inches)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)	30 MPH-LEAD (Feet)
0	-2.0	0.0	3295	0.0000	3617.1	0.0	0.0
100	26.4	0.6	3054	0.0946	3106.5	-1.7	4.2
200	51.1	2.6	2825	0.1967	2659.1	-7.1	8.7
300	71.3	6.0	2608	0.3073	2266.3	-16.9	13.5
400	86.5	11.1	2401	0.4271	1921.1	-31.8	18.8
500	95.6	18.0	2204	0.5576	1618.2	-52.8	24.5
600	97.6	27.0	2016	0.6999	1353.8	-81.0	30.8
700	91.0	38.4	1838	0.8558	1125.3	-118.0	37.7
800	74.0	52.6	1671	1.0270	930.2	-165.5	45.2
900	44.6	69.7	1517	1.2155	766.6	-226.1	53.5
1000	-0.0	90.2	1378	1.4232	632.6	-302.6	62.6
1100	-62.9	114.4	1257	1.6513	526.5	-398.7	72.7
1200	-147.9	142.2	1157	1.9004	446.3	-518.5	83.6
1300	-258.8	173.5	1080	2.1693	388.5	-665.7	95.4
1400	-399.5	207.8	1020	2.4556	346.8	-843.2	108.0
1500	-573.7	244.9	973	2.7574	315.2	-1053.2	121.3

[View a text version of this table](#)

Note: G1 drag data tends to be optimistic at lower velocities.

I next headed for a range with 1,000-yard markers. I changed ammunition for the longer shots, this time using Norma 150-grain Barnes T Shock. I had shot this load often through my CZ American .300 Win. Mag. and, judging by the number of whitetail that had died to the hot .30-caliber, I was interested to see what the XM2010 would do with this same load.

The Horus reticle, with its advanced Mil Dot design, retained enough elevation that, coupled with the Weaver rail's added 20 Mils of elevation angle, told me that getting bullets on steel wouldn't be much trouble. The only thing I needed to do was dope my holdover and transfer it to the Horus hashmarks. Simple enough, even in a guestimation based on the 600-yard work, but even with that knowledge, I computed the required clicks to about 168, a large $1\frac{3}{4}$ turns of the turret. With a good spotter, I was sure we could quickly dope the impact point for a successful 1,000-yard shot.

My shooting partner Jerome Besler was on the Swarovski ranging glass, as I set up for the first round. Pulling 4 Mils for elevation at 700 yards, I gave it a go, as Jerome watched for the splat. Yes this was hunt-and-peck shooting, but I had observed this system more than once in U.S. Army footage of live-fire sniper missions Afghanistan. A primary reason the new Remington is going into service as a high-powered .300 is to gain operational distance on the bad guys, who like to strike our forces and then fall back just out of .308 NATO range.

At the shot, Jerome discussed a possible impact point over the nearly silent suppressor, the 150-grain bullet still traveling downrange in a wide and high arc over two tractors, three cows, and a water tank. When the bullet slammed against the gong, the call by Jerome was "Hit!" and it was instantly time for the 800-yard marker.

At the new distance, Mil adjustment was required, and again I guessed the elevation based on gap ranging, along with a gut feel for the shot. One

more Mil was the choice, and now, at 5 Mils and a high hold on the 12 o'clock position against the gong, I sent a silent 150-grain bullet downrange. The air had gotten a bit damp by this time, and the vapor trail given off by the bullet turned just about to a pure white spiral all the way to the target, clear enough that Jerome called the shot before it made contact. The whole thing was surreal as could be.



Brezny over the Remington XM2010, performing 600-yard testing.



Jerome Besler on the XM2010 at the 1,000-yard bench. This was the moment of truth.



The author with XM 2010 setting up for 1,000-yard shooting. The only problem with this Remington rifle, he says, is that it's not his. (Apparently, the U.S. State Department has the first call on this one.)



Top to bottom above, the Remington XM2010 receiver, full-length view, and buttstock.



The suppressor on the XM2010. This AAC “can” was nearly completely silent—no recoil and nothing but the dead, flat sound of moving air. “Freaky,” I believe, is the word here.



Another view of the extraordinary Remington XM2010.

After Jerome took a turn on the rifle and again hit home, we moved the bench back to the 900-yard mark; it wasn't the 1,000 yards we wanted, but, with our tails almost out on a dirt road, we were at the limits of the club property. I dialed up 5.5 Mils and a wind adjustment of 2 mils left, as we now had a morning breeze around a 30-percent value from left to right. My first round sailed towards its destination, as Jerome and I discussed its flight and where it just might hit. After what seemed like forever, the return of a bullet against steel came back to us. I rushed the next round a bit and it went low, but the next two bullets were shot inside an MOA group. Jerome jumped on the rifle next and, after sending one round drifting about a foot right of the gong, readjusted his view and slammed the next two bullets into the center of the steel plate. A good day of shooting, bar none.



Remington's XM2010 is a long-range stealth shooting system of the first order and the sniper rifle for the future.

KIMBER 8400 ADVANCED TACTICAL

The 8400 Advanced Tactical comes in at about 13 pounds empty, and a bit more when paired with a Leupold M-4 Mil Spec sniper scope. This rifle was about two years backordered with Kimber at the time I was writing this book, and I was darn lucky to get hold of one for my personal use. To my knowledge, the availability situation hasn't changed, certainly indicative of what I've been saying throughout this book, as to the popularity of long-range shooting and the consumer demand for advanced tools to satisfy the sport.

The 8400 retains a heavy barrel, blueprinted Kimber receiver/action in the Winchester M-70 style, a beavertail fore-end, and fully adjustable McMillan sniper stock. Dressed in desert tan camo, with a tough overlay finish on the steel, this is one hell of a rifle available in the civilian sector.

I zeroed the Kimber at 100 yards, then began my testing as I'd done with the Remington. I turned 14 clicks on my elevation turret based on the data recorded on the Accuracy 1st Whiz Wheel (a handy tool for long-range shooters; www.accuracy1stdg.com). Accuracy 1st had developed this particular Whiz Wheel for this specific rifle, based on its rate of twist and the load being used, information I'd provided the company. I guess I played the program game correctly, because the slap of the bullet indicated I was on steel with the first shot.

Heading for the 600-yard marker, I now added some framed targets of a black bear and a Birchwood Casey blue upper torso target. Back at the bench, I then put two rounds into the humanoid target center mass and five rounds into the bear silhouette. There was no question at all that the M-4 and Kimber were doing their jobs.

ACCURACY INTERNATIONAL LTD AE SERIES SNIPER RIFLE

Not long ago, I was asked by Accuracy International and Federal Cartridge/ATK to join some of their staff on a long-range mountain hunt for my favorite targets, rockchucks. When Todd Seigmund of Accuracy International, the English company that builds long-range rifles for the British army, offered to loan me one of its very latest "sandbox" sniper rifles, I jumped at the chance.



The author with a Kimber-designed sniper rifle in .308 Win., shooting government match loads at 600 yards. The Kimber came across his shooting bench in two configurations, including a .300 Win. Mag. and his now personally owned 7.62 NATO/.308 Win. Brezny says, “I shoot the .308 Win. a great deal in several rifles, because it is easier to get ammunition for it compared to other rounds and, in some cases, I can shoot surplus ammo, even at long range, with some outstanding results.”



The author and 600-yard steel plates addressed with the Kimber, an M-4 Leupold scope, and match ammo. Brezny says the setup made this target easy.



The Accuracy International on prairie dogs in South Dakota, via John Sanders of Alberta, Canada. This particular rifle in .243 Win. makes for a great mid-range varmint gun.

Just about the time the rifle arrived for testing, I received a call from Tim Brandt of Federal Cartridge. He asked if I was at all interested in a rockchuck hunt that would be based out of Twin Falls, Idaho, and headed up by Rod Herrett, a well-known handgun stock builder. Tim told me my rifle choice would be all mine and Federal would provide the necessary ammunition and other assorted gear. Without a second thought, I accepted Tim's offer, explaining that AI's AE sniper rifle would get the nod.

The AE series turn-bolt was built for war and most commonly chambered in 7.62 NATO/.308 Win. However, the rifle I had ordered was chambered in .243 Winchester, as the thrust of my writing at the time centered around its possible use as a varmint rig when very accurate shooting over longer ranges was required. Thus, ammunition selected for the hunt was Federal's

70-grain Ballistic Tip. For this hunt, with winds always changing in those mountains, I figured it to be a spot-on choice by Tim.

This British rifle, now offered in the USA, is best known as a hand-built, custom centerfire rifle most often used by the British military for ultra long-range sniper work. While rockchucks in the Sawtooth Mountain range certainly aren't war-mongering bad guys, the basic design of the rifle clearly said it could take on just about any type of distance work.

Everything about the Accuracy International rifle has been well thought out. In fact, during my last hunt in Australia, I sat down with the actual designer of the rifle's barrels and got an ear full about what went into making the gun a ballistics success. Technical chatter aside, suffice it to say that the barrels are interchangeable, with swap-outs in the field taking place in under 15 minutes. Beyond the barrels, the heavy composite stock provides great ergonomics for the shooter, and, due to what I believe is the heavier weight of this rifle in conjunction with its stock design, the recoil is much reduced over a standard or target-style walking varmint rig. As for accuracy, the AI retains a bolted four-screw receiver housing permanently bonded to an aluminum stock frame. All major receiver components are tied to that frame and, as such, the barrel and action won't shift regardless the temperature or other weather conditions. It is rock solid: After zeroing at 100 yards, the rifle never moved off zero over weeks of shooting, even when transported by the airlines.

For the most part, the AI has to be just about one of the best turn-bolt rifles ever put together for distance work. In the military, the rifle distinguished itself by taking top honors as the best of the best, with some outstanding records established during combat operations. Sharpshooters love it, and by building its reputation as the best rifle in the military field, it is fast becoming a part of the American sporting scene, as well.



The buttstock on the AI rifle.



The AI's receiver. This rifle is a first-class long-range gunning system.



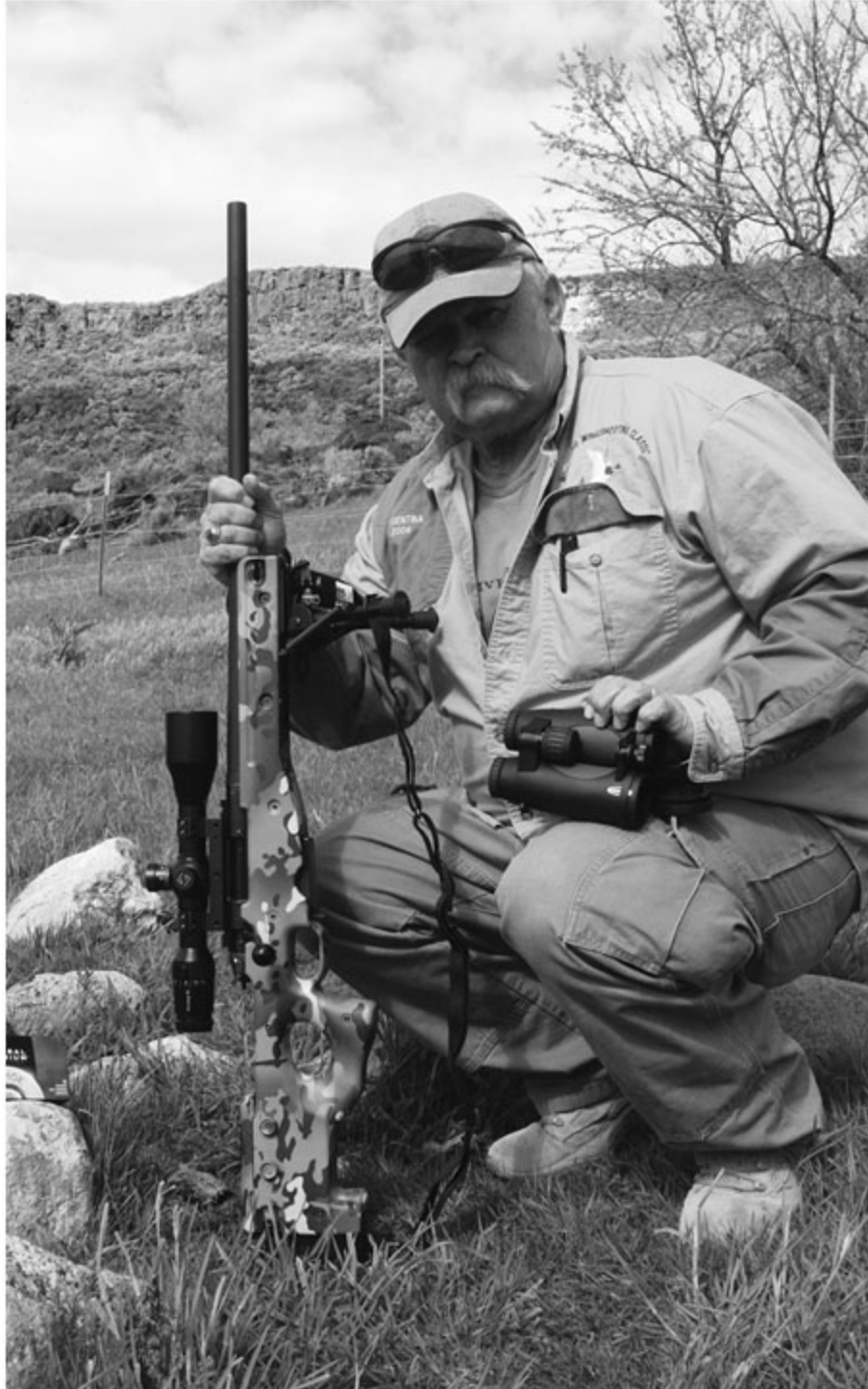
The AI going hot on a South Dakota dog town.



The Accuracy International on the bench, ready for rockchucks.



The Accuracy International in .243 put many a rockchuck to sleep.



Brezny with the AI rifle and Rapid Z optical system.

During my testing, in the mountains, shooting conditions were always shifting, primarily due to the terrain. Deep open passes leading down to

narrow, rock-laden draws made range estimation difficult, if you lacked a good rangefinder. Thankfully, we didn't, with Swarovski filling that niche. The Zeiss varmint scope in a new Victory model with a Rapid Z reticle did the rest of the sighting work. A very clean trigger of about two pounds on the rifle and a lock time that was lighting quick made for 300-yard kills that were nothing less than cold-blooded murder. When pushed out to 450 and 500 yards, crosswinds and downdrafts in the big hills took their toll on accuracy at times, but a little dope and some "splat" indicator shots helped walk subsequent bullets right into target.

In general, mountain marmots or rockchucks can be few and far between. We were fortunate, as the critters were just about everywhere I glassed with my Steiner 7x auto-focus police/military binocular. I easily spotted the light yellow fur backs of these big critters sunning themselves atop flat boulders. (As an aside, I realize that, at times, it may seem as though writers stick in products during a review simply because they were used, but, believe me, my friends, if this equipment didn't work very well, it would not be here in *this* review. As I see it, my job is to make this business of hitting things a long way off easier for you and not just some fairy tale bull session.)

With a full case of .243 Ballistic Tip bullets in Federal Premium ammunition, we were quickly able to produce spot-on accuracy through the AI and score enough one-shot hits at ranges beyond 400 yards that the rifle quickly got my vote. In fact, I took to it so much that I decided this was the rifle and ammo for my next Australian kangaroo hunt. Believe me, when you travel almost around the world to hunt, you don't take any chances on the gear you take with you.

Accuracy work with the test ammunition back home showed sub-MOA groups under .782 as a reasonable working average for three shots at 100 yards. I tend to believe that I could have shot better groups under a more

controlled environment, but Dakota days are what they are, and I never found a dead-air morning to shoot one-hole groups with the AE series rifle. That said, I do believe this rifle is quite capable of staying even with custom bench rest rifles well out to 600 yards or more.

One note: I believe the rifle possesses a 1:10 twist based on my measurement, but I didn't have data provided to confirm this. The rifle held factory loads and some added handloads to the following levels of accuracy.

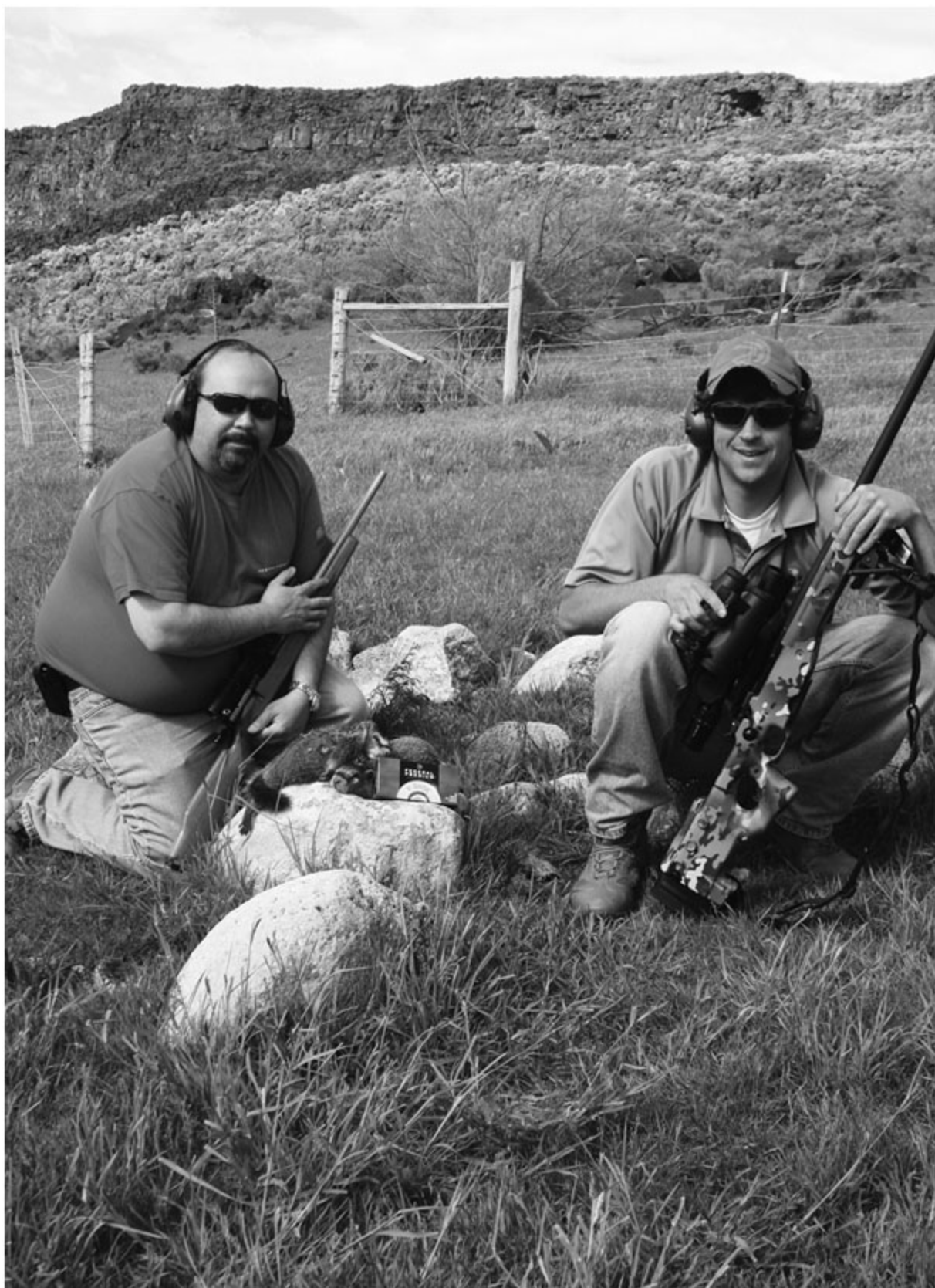
About a week after returning home from that very successful chuck hunt, I hooked up with some friends for a dog hunt nearby. I hung back with John Sanders, a Canadian wolf hunter during the winter, and the two of us headed into the dog towns, hauling along the AE .243 Win. I now fed it Hornady 58-grain fodder that was home-rolled, along with Sierra 60-grain hollowpoint boat-tails in another bench-built round. This shooting would involve hunting at about 4,000 fewer feet in altitude from the work I'd done with the rifle in the Sawtooth range, as we gunned across a table-flat area of the western South Dakota prairie. We could select targets at will that ran from point-blank range to as far as 800 yards and more. In no time at all, the big sniper rifle with its quick, light-bullet handloads was taking the tops off prairie dog lodges, with a hard smack of the bullet and a cloud of Dakota brown dust each time. John, despite having his own professional-grade hardware along, took a turn behind the AE .243 and sent a number of prairie dogs to their maker. He ended up liking that gun so much, it was almost hard to pull him off the rifle, after he smacked several warm targets at ranges well beyond the working limits of his .223 Remington.

With the AI mounting an easy to access turned-down bolt handle, a design intended to accommodate extreme cold weather shooting, and an action that was as smooth as polished glass, the AE was a pleasure to work with. Featuring a 60-degree opening, three lug lock-up and a .256-second

striker fall, the action is lighting fast from trigger break to detonation. This rifle also makes use of a detachable box magazine that is more of a military thing, but handy versus a pocket full of loose ammunition. The barrel measures 24 inches, is stainless steel, and is of a match-grade quality. The stock has an alloy core designed with an overlay of poly material, making the complete barrel and action bedding system rock solid for any level of extreme weather use. The fully adjustable buttstock and multi-sling stud fore-end design is built bank vault tough. The gun is a bit heavy (13 pounds, four ounces), but rifles designed for long-range use are usually heavier than walking-type varmint rigs. I'd say the AE is best adapted to either a mobile mounted or static application—well, unless you're in the business of humping over sand dunes in search of bad guys. I shoot many of my heavy rifles off the rear of my pickup truck bed set up with a Big Shooter benchrest table, and sometimes off the deck of my Polaris RZR ATV.



Federal's .243 Win. ammo produced solid accuracy to 400-plus yards on mountain rockchucks.



Tim Brandt, right, and a fellow engineer at Federal check out the AE and the .243 fodder being shot.



Rockchuck country is built for long-range rifles.



Tim Brandt of Federal Cartridge on the glasses and ranging equipment, searching out targets.

BENCHREST AI AE-SERIES RIFLE IN .243 WIN. AT 100 YARDS, THREE- SHOT GROUPS

POWDER LOAD	CASE	PRIMER	MV (fps)	PRESSURE (ft-lbs)	BULLET	GROUP
Varget 41.0 grains	Federal	Federal LR	3,474	Book 54.500	70-grain Nosler BT	.884
IMR 3031 38.0 grains	Federal	Federal LR	3,428	Book 53.100	70-grain Nosler BT	1.046
	Federal	Factory	N/A		70-grain Nosler BT	.782
	Federal	Factory	N/A		85-grain Barnes TS	1.022
Varget 44.0 grains	Winchester	Winchester LR	3,739	Book 52,000	58-grain Hornady V-Max	.992
Varget 47.0 grains	Winchester	Winchester LR	3,975	Book 62.800	58-grain Hornady V-Max	1.028
Varget 40.0 grains	Winchester	Winchester LR	3,671	Book 45.400	60-grain Sierra HPBT	.769
IMR 3031 37.0 grains	Winchester	Winchester LR	3,520	Book 38.300	55-grain Nosler BT	.599

[View a text version of this table](#)

While the Accuracy International bolt-action sniper/long-range rifle is far from a low-budget item, it should be kept in mind that this firearm is not designed expressly for recreational shooting; without question, its military application is first and foremost. As such, for many of England's finest who

will shoulder this rifle, no expense is too great. The side benefit to that military lean is the fact that we predator and pest control hunters get to reap the rewards of all the research and development that has gone into a rifle of this performance level.

THOMPSON/CENTER ICON

Equipped with a Burris Eliminator ranging scope, the T/C Icon Sniper Rifle weighs in at a hefty 13.10 pounds empty. Mounting a box magazine that carries three rounds, this rifle, with its custom designed and fully adjustable sniper stock, is yet another complete first-class act as a long-range gunning system. My rifle features a stainless steel fluted barrel of 24 inches and makes use of the Russian-developed (and for a time classified) R-5 rifling (five grooves). With a recessed crown, cut rifling, and blueprinted action on T/C's new triangular/flat-base pillar-bedded design, this tactical rifle shot like a dream. With an exact three pounds of trigger pulled measured by Timney's scale, the rifle's let-off was smooth and lacked any excess travel or creep. When taken to The Chip, Sturgis, South Dakota's big, 800-yard range, I found that, at 400 yards, I was able to shoot sub-MOA groups with ease. Putting the Burris ranging scope to good use and shooting the Icon at ranged deer and humanoid torso silhouette targets, it was simple to select a 400-, 500-, or 600-yard target, range it, watch along the vertical post for the lighted yellow dot marking the holdover, and judge hold-off for a slight full-value wind. That bit of work done, I set my cheek weld and tripped the trigger to send the 168-grain Sierras to their mark with consistent success.



The T/C Icon sniper rifle benched for testing.

Next up were warm targets, so the rifle was hauled out onto a wide prairie flat that fell away to a winding streambed usually teeming with game. I say usually, but not this time. After burning daylight for two full afternoons on the 100 feet of ridge above the waterway, only one young male song dog came wandering down the edge of the waterway to my call of a faint mouse squeak. Thanks to the Burris scope, not to mention the accuracy of the sniper rifle, that coyote ate a .30-caliber 168-grain Sierra bullet at a bit over 350 yards.

As a final go with the T/C rifle, I headed for the deep Black Hills and, with the aid of my RZR rangefinder, searched out various white limestone rocks at all sorts of distances. Here in the big hills, a rock wall some 1,500 yards away is a possible target, just as are clusters of one-ton stones at 600 yards. (As a small note, I shoot this run after wet weather has drenched the

hills. Stone and fast-moving projectiles can start a fire, which spells pure living hell for the folks who live up here.)



Testing the T/C on distant buffalo chips in South Dakota.



A zero check at 400 yards, the author's personal limit when hunting big game.



The T/C Icon against 500-yard police targets.



From rocks to coyotes, the T/C in .308 Win. is deadly.

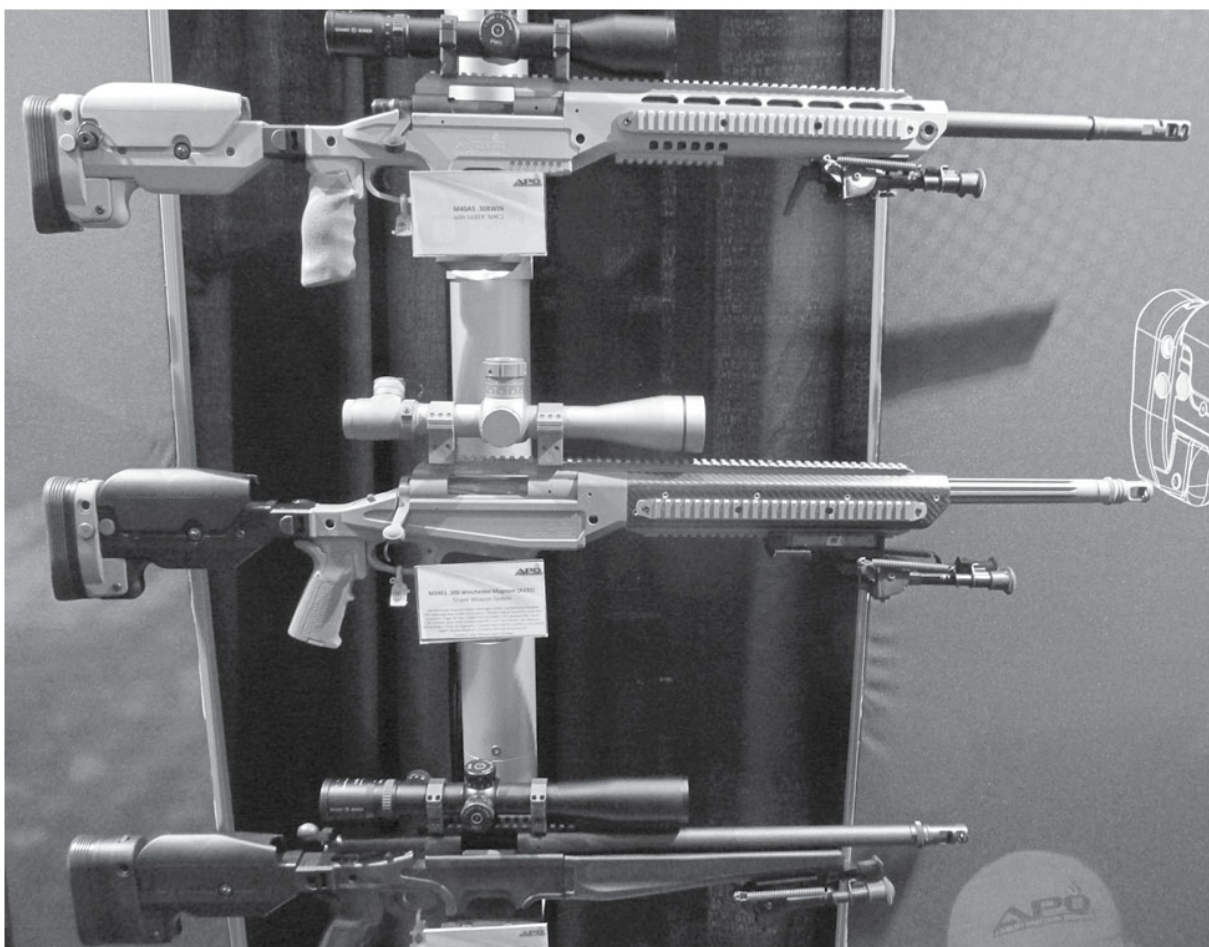
Shooting Russian-made Hot Shot-brand surplus ammo of 150 grains, which, for the most part, has displayed some very solid accuracy, I rolled into the 5,000 foot hills with both the Burris ranging scope and my Whiz Wheel hand-held slide rule-style ballistics calculator. My first target was a large white limestone with a black area in the center of it at a ranged 210 yards. I wanted to run a close-range round at the target, to double-check accuracy, as the rifle had been cold for several months. At the shot, the center of the soft limestone blew out, leaving a deep crater in its place. I took the next rock that registered 315 yards and, then, over the course of nine additional rounds, I covered rocks out to 470 yards at a rate of 100 percent.

THE NEW CHASSIS RIFLES

The chassis rifle is the newest breed in precision shooting. Eliminating the need for bedding, they are fast gaining the attention of serious shooters everywhere. Let's take a look at a few.

Armalite's AR-30A1

This rifle, chambered in .300 Win. Mag., is clad in an all-metal aluminum skeleton and retains a fully free floating barrel equipped with a substantial muzzle brake. The outer tube or shroud has Weaver rails on the sides and top and is vented for heat dissipation at the sides via three long and wide ports. Everything from the muzzle to the receiver is linked at the receiver ring; nothing of the barrel or firing mechanism touch the stock, save for the point under the magazine well and the receiver's lower surface. This is why tube guns return such outstanding accuracy in competition and in their sniper field roles; there are no pressure points to affect accuracy.



Advanced tube and chassis rifles are becoming more abundant. Prices will range from \$1,000 to more than 10 times that.

The test AR-30A1 has a complicated buttstock that's fully adjustable for length and comb height. Add the AR-style pistol grip, and the rifle, when mounted on its Harris bipod, makes a simply outstanding long-range .300 Win. Mag. platform. Wearing a Steiner Predator scope, the rig came to 16 pounds, not anything you'd consider lightweight. These rifles need a static position, a sniper's drag bag, and a ride on a vehicle of some type to get them hauled around.

Testing this AR-30A1 was flat-out fun. Recoil was nonexistent, and the muzzle brake, while a bit rough on anyone standing to my side, was very

effective for the shooter. Shooting to the 1,000-yard steel plates was positive.

Right off at the 600-yard bench and with the aid of the outstanding and crisp three-pound trigger, the first round after a 100-yard zeroing slapped the steel a bit low, but allowed a correction at once via a ½-Mil to bring the Norma 180-grain Oryx bullets to the proper impact point. In truth I have shot this 600-yard steel so many times, with so many different rifles, cartridges, and sights, that I can almost dope any sight into it with first-round hit probability. The real test was to push the AR-30A1 out to that magic 1,000-yard mark.

Late in the fall during this testing, the weather in the Dakota was staring to turn, and I had the problems of light snow and frozen ground to deal with. What that meant was that I could not gain the edge the “splat” of a bullet striking ground and making dirt fly provides. On the day I pushed the 1,000-yard steel plate, I also didn’t have a spotter with me, which added to the challenge. With the drop factor so nuts, I simply trusted the Mil settings on the Steiner glass, adjusted my parallax setting, then pulled to a full 5½ Mils and sent out a round. With cold air, zero wind, and a hot guess, my bullet was spotted striking low and left in a slight puff of snow and gravel, but that was all I needed. The second round cracked the lower edge of the steel gong and cut a little snow, sending a spike of white mist high over the steel plate. I called that success.



The new Armalite AR-30A1 ready for evaluation.



Armalite's AR-30A1 readily puts varmints to sleep.

As a static-position rifle for long-range shooting, the AR-30A1s (and I am sure the new model AR-31) are outstanding rifles. Benchrest, ultra long-range target, and varmint hunters are going to gravitate to this rifle, to be sure. Perhaps most telling is that, over the course of the early winter in South Dakota, with temperatures falling to 10 below zero, the rifle was hard-nose tested for the cold shot—and she shot accurately right out of the gate each and every time. Accuracy tests weren't pressed to the wall during this time of year, but zeroing groups all fell into MOA or better. That said, if your search is on for a class act in a super tube gun, you have just found your answer in the AR-30A1.

Kimber Advanced Tactical SOC

The Kimber SOC is an aluminum tube rifle built on a Manners MCS TF-4 fully adjustable folding stock, and retains a fully adjustable sniper stock system. Based on the standard turn-bolt Kimber 8400, this rifle mounts a drop magazine, match-grade barrel, Mauser claw extractor, and controlled round feed. With an oversized bolt handle and blueprinted actions, all configurations shoot to ½-MOA or better. The Kimber AT-SOC is something to consider in the event your shooting needs demands long-range precision. Rifles are offered in .308 Win. or .300 Win. Mag., and they bear a close resemblance to the Surgeon brand of tactical rifles.

Howa Axiom Heavy Barrel

The Howa Axiom is best described as an entry-level long-range rifle. Offered in several calibers for short actions, the best choice for extended-range shooting is the .308 Win. The rifle nicely supports a fully free-standing barrel, and the stock retains a full pistol grip and a roll-over cheek piece with the Blackhawk recoil reduction design. The rifle is a great choice

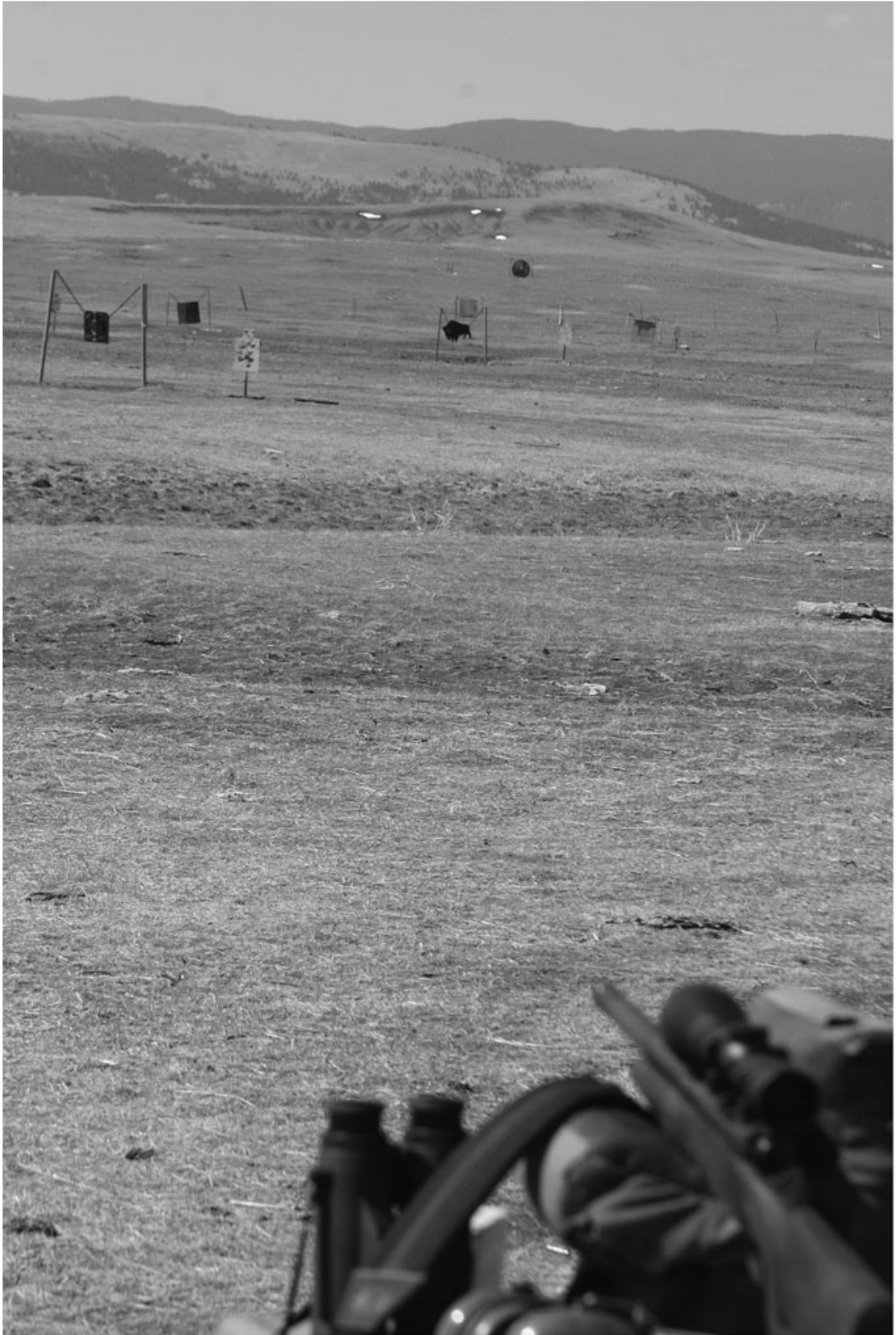
for new-to-the-sport long-range steel plate shooters, as well as big-game hunters who shoot from static positions. I would recommend this rifle based in .308 Winchester for target work out to 600 yards and big game inside 400 yards. Howa also offers a kit rifle with optics.

Savage 110

Having used this gun in both police and sniper variants, I feel confident in saying that the Savage 110 is another sound starter rifle, yet also one that just may stay with the shooter a very long time. I have owned several of these and still activate one in .308 Win. for both steel target work to 600 yards and big-game hunting on the wide Missouri River flats of central South Dakota. Savage offers the AccuTrigger in this very accurate rifle, and the good folks at Timney Triggers are building an advanced target trigger for it. I have one of those Timneys installed on mine and have grown to like it very much. With a medium-heavy barrel, target pillar-beaded stock (aftermarket chassis options are available), and good sights, this rifle is a tight-budget tack-driver that I would put up against anything out to 600 yards. (I've observed some 600-yard benchrest shooters turning to Savage bolt-actions in their full factory out-of-the-box rifles for tough, big-money competition in the past several years.) The sister to this rifle is the new 110 BA, with a muzzle break, rails, and a platform-style tube stock chassis. This rifle goes up in price quickly, compared to a standard stocked rifle, but it is offered in both .308 Win and .338 Lapua.



Stock the Savage 110 action in a high-grade chassis stock and you have upgraded into the big-time long-range crowd.



Steel targets set to 1,000 yards for testing the Savage.

NEMO

Based on the original AR Armalite platform, NEMO's (New Evolution Military Ordnance) heavyweight .300 Win. Mag. is a super gun built for the shooter who wants it all in downrange energy and accuracy, but in a semi-auto. Interviews with professional snipers in this book have indicated that the military variant in 7.62 NATO, with a 10-round stick magazine, can be a deadly force in the hands of a good marksman and efficient spotter under combat conditions. The new Watchman, Omen/Match 2.0, Recon .300 Win. Carbine, and PRATKA budget-priced .300 Win. Mag. rifles all deliver the long-range calling cards where and when required.

Lazzeroni Custom Bolt-Actions

From the outstanding 7.82 (.308) Warbird. to the 6.53 (.257) Scramjet and 8.59 (.338) Titan, the Lazzeroni custom cartridges hold a singular place in the performance rankings. Like Roy Weatherby's historical lineup of special, Norma-based big-game cartridges, the line up of Lazzeroni fuel cells and bullets will get the job done *way* downrange.

Based on the Long Magnum Tactical and available in Warbird or Titan chamberings, the model L2012TCT will send the mail out to 1,500 yards. The rifle retains a fully adjustable buttstock, extended grip section, and removable box magazine. Outfitted for accuracy with Weaver rails and muzzle brake, the rifle is ready to rock.

Ashbury Precision Ordnance

APO builds long-range chassis sniper rifles that make use of carbon fiber material along the fore-end, to help reduce excess heat when the rifle undergoes a high rate of fire. These rifles make use of an all-metal skeleton frame from the fore-end to the buttstock. I asked APO'S CEO why this rifle

was not in the final competition for military consideration alongside the Remington XM2010. He told me that a broken trigger took them out of the running early on and they didn't feel staying with the military's program and the massive cost involved was worth the effort. A broken trigger aside, I can say that this rifle is world-class, an out and out ultra long-range shooting platform.



Lazzeroni's custom long-range rifle chambered to the company's proprietary cartridges.



Caracal, a company from the Middle East and new to our shores, offers this chassis gun variant in the long-range genre.

Caracal

Caracal is a foreign-based company that's applied some special elements to its chassis stock design and the modern turn-bolt rifle. The CS .308, for instance, is a 7.62x51mm NATO-chambered rifle, with .338 and .50 BMG options also available. The rifle is offered with an aircraft-grade aluminum frame/stock, stainless steel receiver and bolt, and recoil absorbing buttstock system. This rifle is really an "almost tube" style of chassis, a design so new that, as of this writing it had no MSRP.

McRee Precision Platforms

While not a complete rifle, rather the frame and guts for building your own long-range rifle, McRee Precision is a company born out of experience in real-time war situations. It offers stock options for changing out your

own barrel and receiver. When evaluating cost, I figure that, by taking a deadly accurate Savage 110 barreled action and turning to this type of installation, one can keep the cost to under \$1,000 (less optics). Since I have tested chassis rifles for this book that cost upwards of \$15,000, McRee's restocking option looks pretty good.

TrackingPoint Smart Rifles

No sooner had I written and tested the advanced TrackingPoint ballistics systems when these special optic units came out with Remington Arms both in a sub-sized version and several additional rifles in the full-house version of the company's highly unique ranging and firing automatic computer solution. This system is so good, some want it outlawed—and that says yes, it is a viable asset to the long-range shooter. Well, at least the few who can afford the price (starting around \$10,000) for this kind of technology.

The 1000 Series 338 T and 300 T are built on a metal frame platform. Offered in .338 Lapua or .300 Win. Mag., the rifle constitutes the blending of technologies from several brands, including Surgeon, XL Action, and Accuracy International. This includes the AX chassis system with detachable rails and Harris bipod with Larue quick-detach mounts. In .338 Lapua the rifle is programed to function out to 1,200 yards, while the .300 Win. Mag. will compute rounds to 1,000 yards.

CHAPTER 5

THE BLACK GUN EQUATION

WHILE THE BULK OF this book has and will continue to center around becoming more knowledgeable about long-range rifles and loads, there is a gray area in this discussion that commands some attention. This area I am referring to is the group of cartridges and rifles that are often considered mid-range tools versus dedicated long-range shooting platforms. In this group fall the AR-15/M-16, AK-47, and an assortment of others that have, at times, bid for military contracts. Among these rifles/cartridges are those chambered in several short .30-caliber rounds, as well as the ever-lovin' .223 Rem./5.56 NATO.

When I review my experiences with many of these rounds, what I find is that, in some cases, writers tend to downplay their performances when the discussion turns to extended-range shooting. Fact is, real-world events involving many of the so-called mid-range rounds show they actually tend to do quite well when range is pushed out to the realm of the bigger, more-respected long-range cartridges and rifles.

PUSHING THE 7.62X39MM RUSSIAN SHORT

In general, the 7.62x39mm Russian Short is considered less than a long-range round. As an assault round developed for machine guns prior to WWII, the tapered-cased cartridge never was on the best-dressed distance list. Be that as it may, when charts are reviewed covering an assortment of centerfire military and civilian cartridges for the purpose of long-range

work, the starting round on that list is, in most cases, the 7.62x39. I set out to find out how much merit there was to this.

With a setup near my home that retains steel targets to 600 yards from the bench and an option to send bullets to the 997-yard mark, you could say I have nothing less than the best of all worlds for distance testing. Just more than 10 minutes from my front door, I regularly turn to this section of open prairie for my evaluations.

During the spring of 2012, several good shooting buddies and I got together to double-check our rifles for the annual trip to the Missouri breaks in central South Dakota, our yearly hunt for some long-range whitetail and mule deer. My business partner, Jerome Besler, had hauled along a reworked Romanian AK-47 equipped with a special Weaver-style ramp bridge for scope mounting, a can suppressor, and a Trijicon Accupoint T-R optic. It's worth noting that the mounts were solid and the scope was upper end for long-range work. With the Russian Golden Bear 125-grain soft-point ammunition being faster than our American rounds, everything made this a well-dressed AK-47.



This AK's milled receiver helps accuracy. Note the better quality.



The AK-47 with better sights can shoot much more accurately and farther than some would suggest.

We set up at the 650-yard marker on our range, with a set of steel “sniper” targets set up for some practice. Jerome hauled out the AK-47, locked a 20-round magazine into its receiver, and proceeded to send a few round at the 300- and 400-yard steel targets. When he turned to the 650-yard plate, things got very interesting.

My other close friend Tom Hanson positioned himself to look through a spotting scope, while Jerome locked onto the steel target. Jerome pulled up about 4.5 Mils toward the six o'clock position in his glass sight and promptly dropped a 125-grain round almost dead center into the chest area of the steel target. That got my attention, as well as Tom's. Now the game was *on*!

After some bantering and wisecracks about pure luck and all, Tom got behind the rifle again. It was my turn to man the spotting scope, and as I looked around, I noticed a prairie dog about 10 yards behind that final steel target, a shot just a bit more than 650 yards. I marked the shot for Tom and instructed him to give it a go. With all the Mils used up and the turret adjustments almost a full turn from zero, Tom's round went downrange and, with a distinct crack, lifted the target which was not a dog at all, but a soft, yellow-colored stone, about five feet in the air. When we got to the stone a

bit later, we saw it split in two. Directly behind it was the bullet, a bit blunted, but recognizable lying there on the surface of the hard Dakota prairie soil. Was the 7.62x39mm about all used up at this distance? For sure it was, but, lacking a stiff crosswind, the shot was predictable. Since that day, I've taken several 7.62x39mm turn-bolts into the hills via my ATV and played a stone-shooting game at long range with them, usually with much success.

My point to all this is to never underestimate any of the current centerfires in terms of their "known" effective range limits. Depending on the target choice, many of the sub-sized cartridges can pull off some amazing shots.

THE AR-15 AND ITS 5.56 NATO ROUND

Like the AK-47 Russian Short round, the AR-15 in its 5.56 MM NATO chambering is not at all considered a long-range cartridge and rifle combination. The military applies the rifle to service out to 600 yards, but, in most circles, it's not looked at as being an effective field tool at such distances. I'm here to tell you why that should change.

This tale begins at one of my usual haunts, the Silver Spur Ranch in east-central Wyoming. This time around I was hunting with my friend Matt Rice, a representative of Smith & Wesson firearms. Tacking on some help from Hornady and its vast quantities of donated ammunition at a time when bullets were indeed hard to find (2013), and we have the makings of a grade-one varmint hunt.



Brezny with a Nevada coyote taken on a winter hunt with a .223 Remington VS Police R-5 Sniper rifle.



Don't ever sell the 5.56 short. She will make you look foolish every time. Here is a double kill with the light rifle at medium-range limits.

Rifles were the variants in the S&W M&P that ranged from tactical setups to very basic working models. I had elected to shoot the Smith and Wesson M&P Sport, an M-4 platform carbine in .223 Rem./5.56 NATO, the gun dressed down to be a basic, but deadly accurate firearm. With its melonite bore coating, accuracy was very good, with MOA performance right out of the box. Ammunition for all the guns on this outing were rounds from Hornady's Superformance line, which make use of the V-Max bullet design.

After our zeroing session, Matt decided to set into play a bit of a contest among the writers and other industry folks in camp. The rules were simple: Using a guide as an official range estimator, each team of two shooters would have their kills recorded and duly witnessed, but the goal, naturally, was the longest recorded shot.

I'd shot the ranch several times before and knew areas that lent themselves well to pushing bullets a long way off, when trying to drop a round on a fat Wyoming prairie dog. My guide knew these areas, too, so, in agreement, we headed right off to a high ridgeline that gave way to a steep drop into a wide, deep basin that stretched out for a good $\frac{3}{4}$ -mile in two directions. At the basin's floor sat a stock tank with a small spillway stream that flowed to the east. Prairie dogs were setting up lodges along that waterway, and ranging the distances there returned the possibility of shots from 400 through 700 yards.

Being as how my partner was shooting a heavy-barrel .223 from the Smith & Wesson custom shop, I kinda figured I was all but out-gunned. The M-4 platform I was shooting would most likely fail to stay with the higher-end rifle, not to mention several turn-bolts in use on other teams, many of which were chambered in .22-250 Rem. and .308/7.62 NATO rounds. The first kill went to my partner, the recorded range just a bit more than 400 yards. Figuring that wasn't even close to being a winner in this long-range game, I glassed a dog at 480, guided my spotter to my find, and then proceeded to send a 55-grain pill in its direction. I had allowed for a slight, 30-percent right-to-left breeze, ($\frac{1}{2}$ -Mil) that was no more than three or four miles an hour, and elevated my Mil Dot crosshairs a full two Mils. With a downward angle of about 15 degrees, I felt that the bullet would more or less eat dirt over the top of my target if I aimed point on at the critter's head, so a low hold with that elevation seemed about right and, at the shot, my fat dog rolled off the mound. I now had a shot close to but not at 500 yards and, with that imprint in my mind's eye, I knew I could adjust for targets farther out.



Remington's Jessica Kallam with the .300 AAC Blackout. This rifle is easy on the shooter, but packs a wallop on target!

My next dog spotted, I dropped the hold-under from the last shot, retained my Mil elevation at two dots with a slight gap in that second dot on the six o'clock point, then squeezed the two-stage trigger on the M&P 15 Sport. There was a slight delay after the initial crack, before the dirt lifted right behind the dogs tail. He had turned away at the very last second, and I was sure that my bullet had impacted right where he had been seconds before. He wouldn't be that lucky the next time 'round, as I watched the bullet hit home. I did not need my spotter to confirm the hit.

While I indeed may have recorded a good 500-yard shot on a coke bottle-sized target with an AR, I was not to be on top of the pile for very long. Matt Rice pulled a 610-yard kill by the next morning and, a bit later, a

second shooter from another team sent a bullet into a dog at 673 yards. Fine shooting by anyone's reckoning.

What all this shows, clearly, is that no one should underestimate any of these modern "medium-range" centerfire rounds. Out here in the wild West, the 6.5 Creedmoor, .223 Rem., .22-250, and others like them are well received for long-range work, including those distances to 1,000 yards, a realm generally considered better reserved for the traditional big-bores, though also for the new .30s (.30 Rem., .300 AAC Blackout, .300 Whisper, etc.). In fact, let's talk about those new .30s next.

ALL HAIL THE .300 AAC BLACKOUT

At a time when funds are short, what military and police rifles are required to accomplish in the field is changing, as in they one gun needs to do more than it used to. Also, questions abound regarding what should be the next accepted military combat weapon. In light of these concerns, the .300 AAC Blackout has emerged as a most promising candidate. After getting some trigger time behind the new round, I can say this is an interesting option in terms of a possible change away from the .223/5.56mm service round that's dominated for so long.

Getting down to the raw bones of this new cartridge, it is a fact that it has emerged directly from a well-proven, but now obsolete, cartridge that was developed by Remington many years ago. In use by varmint hunters at the time, the round was called the .221 Remington Fireball. The parent case to the Fireball, however, was the .223. The Fireball, in fact, was first designed as a pistol cartridge, but, thanks to the basic design and dimensions of the longer .223 Rem, the .221 Fireball can make use of all the same parts in an M-16/AR-15: bolt face, magazines, and everything else save for the barrel remains the same as it appears in the .223 version. This says funds are saved, and that gets the attention of those folks who appropriate money for

these kinds of projects. But who wants to shoot a round last appreciated by a small group of varmint hunters in 1972?



The author firing the .300 AAC Blackout.



Full metal jacket .300 AAC Blackout rounds.

By taking the .221 Fireball case and blowing it out to a neck size of .30-caliber, you've now "gunned up" the light .22-caliber cartridge for better retained energy, enough to drive its bullet fast enough to keep pace with the Russian 7.62x39mm, Remington's 6.8 SPC, and the .30 Remington AR. Of course, and for good measure, it overrides the current 5.56 mm.

There's more. Shooting heavy 220-grain bullets at subsonic velocities (950 fps) with the rifle suppressed (most of them are being built that way), can generate very effective muzzle energy. It has also been indicated by Remington engineers, though their testing, that the 123-grain bullet at a

muzzle velocity of 2,130 fps and 1,238 ft-lbs is effective against light body armor to 300 yards.

So now we have a dual-purpose weapon that is suppressed, can operate well when stealth modes of operation are required, and can still haul the mail downrange in an open-air street fight if necessary. That's a pretty well-rounded cartridge.

Information I have indicates that four rounds are currently being loaded for the Blackout-chambered AR-15. The first three are the 220-grain at 950 fps (suppressed), a 155-grain FMJ, and the 123-grain FMJ. Other developments are on the table to make a barrier-defeating round, and it's anticipated there's to be an assortment of possible handloads for hunters or specialty operators in the private security sector. Of special note, as of this writing, Barnes has come out with an ultra-long ogive, all-copper, 110-grain Barnes TAC-TX projectile that expands to .50-caliber dimension upon warm target contact. This high BC round is a close match to the 7.62x39mm Russian Short, that famed AK-47 cartridge, but the Blackout uses better bullet for varmint, target, and game. Not an ultra long-range round, this new kid on the block is, nevertheless, expanding the shooting experience for those who previously thought they were limited in range in this caliber category.

My introduction to the new Blackout cartridge was at a writer's event held at the Remington Loanoak ammunition plant near Little Rock, Arkansas. After two days of meetings with engineers and participating in plant tours, our group was moved onto the range for some hands-on time with firearms and live rounds. It was late in the event, when a couple engineer types walked up carrying a large box that was different from any other in the area. Upon opening the box, we found an AR-15-class rifle that retained a silencer at the end of a short, nine-inch barrel. A fun touch for us,

the left side of the receiver featured a semi-auto/full-auto latch, making this choice little weapon a sub-machine gun!



Detail of the .300 AAC Blackout.

This rifle possessed the customary upper receiver built by Advanced Armament Corporation (the “AAC” part of the cartridge name), while Bushmaster got the honors for the lower. AAC also designed the suppressor for use with the new cartridge. Keeping in mind that the Freedom Group parent company has linked all these companies together under one brand, it’s little wonder these people would dive headlong into military-type development projects such as the Blackout program. Remington got the call for the cartridge development, as it was based on its own old .221 Fireball.

The test rifle was an engineering mess in some ways, but I still would have taken it home in a flash. The scope was a Leupold heavy varmint model with ultra-fine Mil Dot and spider web crosshairs. It was darn hard to see the Mil Dots in the bright light; this wasn't the type of optic the rifle would have been best paired with, but engineers don't shoot bad guys, they simply want to test their work.



The Blackout in the field, during early testing of the new cartridge and rifle combination.

The rifle did feature a Weaver-style rail system, which would lend its use to far better sights. The buttstock was adjustable for length, and the suppressor used a quick-detach connection much like those found on the well-known Gem Tech suppressors I own and use often on my S&W M&P15-T and Ruger SR .22 LR rifles. Suppression quality via the AAC can was very good, if not outstanding. *Thump-thump*, at a decibel rate well under 130 dB was my guess, even when fired from a roof-covered benchrest. As I not only shoot suppressed weapon a great deal in South Dakota, when hunting both varmints and game, but also manufacture and sell suppressed shotgun barrels (Metro Gun Systems), I think I have a solid handle on what suppressed gun systems are all about and can separate the good from the bad in short order. This system is well to the positive side of any performance standard.

Shooting the 123-grain JHP for accuracy was a bit of a loose cannon, in that we didn't have the customary time and ranging to do a complete and accurate test. Still, shooting by several individuals participating in the testing illustrated that bullets went where they were aimed, for the most part. When the test opened up a bit, I proceeded to double- and triple-tap the gun—and an engineer came running up thinking the rifle had gone out of time and had turned full-auto on me! *That's* how smoothly it ran in *semi*-auto.

For full-auto work, I started in the standing position, braced for a stiff rate of muzzle climb. I've had enough exposure to SAW 5.56mms, Thompson .45-caliber sub-machine guns, SOCOM 7.62 variants, and full-auto M-16s to believe that this rifle would behave similarly, when the range officer called for five- and three-round bursts from the weapon. It didn't. Shooting with the same 123-grain bullets allowed complete control on the target, set about 40 yards downrange. Truly, putting everything center mass

would have been quite easy in a real-world street situation. A move to the 220-grain pills did have me experience an increased rate of climb, due to some additional recoil, but, to be very clear, everything experienced in this test shoot was very manageable.

Make no mistake about it, this gun and ammo combination is well suited for duty, when special operations units are required to make entry into buildings under cover of darkness or advance against open country positions while requiring medium-range ballistic effectiveness. That's a niche that an odd Russian gun has been filling for some. Currently, and for the last several decades (1987 introduction) the Russian military special operations units and police have fielded a variant of the AK-47 known as the OTS-14 "Groza" (Groza translates to "thunder"). Variations on this gun include a blown-out 7.62x39mm to a 9x39mm suppressed wearing a heavy 9mm bullet (260 and 247 grains). The gun has been very well received by troops of the Russian SpetsNaz and specialized KGB units. If the Russian design program looks a good deal like the Blackout projects, especially as it takes on suppressed machine gun tactical rounds, you're not imagining things, i.e., someone on these shores was reading about Russian military advancements in small arms development.

It also shows we've been behind the ball in this respect—but we're catching up! By staying with the M-16 platform we already have in such widespread use, the cost savings are massive, when it comes to new assault gun development. Now add in the Blackout round in any of its current configurations, and you have effective and flexible tools when specialized tasks surface among special ops units. I do know that Remington ballistic engineers are very high on this design, and I would not be at all shocked to learn down the road that this newest round in the AR is doing some hands-on work in that big sandbox across the big pond.



The author made a dent in his local river bottom deer population with his handy ARs.

SHARED GROUND

Nothing good comes from a war, it's said. Still, it's hard to ignore the many advancements that are made during war, and that certainly includes the equipment on the battlefield today. What's important in this, when it comes to this book, is how military-developed equipment is making its way into the hands of the modern American sportsmen.

BLACK GUNS TO FUN GUNS

There is ever increasing civilian interest in the military M-16-type rifle in its many variations so common today. From the first Colt's built and used in Vietnam, to the ultra high-tech fighting rifles being fielded by our army in Iraq, the basic M-16/AR-15-type rifle has come a very long way. No longer is the "black rifle" considered something only fit for general warfare or police work. With its increased ability to chamber many advanced cartridges, new and better receiver locking

tolerances, and a real knack for running well in both semi- and full-auto modes, the AR-type rifle is the most popular firearm in production today across America, from military to police to civilian. Call it what you like, just as it was with the Winchester 94 and Remington 700, it is an American rifle to the last screw, pin, and piece of steel.

Our soldiers in Iraq have required advanced development of the M-16, due to the house-to-house fighting so endemic to the war there. Simply, this new combat took the AR away from its open-country or jungle terrain environments of wars past. The modern American soldier in Iraq needed independent lighting systems, sighting systems that were both day and night failsafe, and a rifle that commanded enough accuracy to double as a sniper rifle, if required. The end product of all the changes has been the M-4 with its ACOG sight, special rail mounts that allow the use of night sights and lighting equipment, and dependable operational accuracy when called upon, no matter the job.

During the past year, I have spent many hours in the field with nine different variations of AR-15-type rifles. In each case, I was taking on game and varmint targets, (and obviously not fighting any sort of war or participating in a police action). I'm not alone in these kinds of pursuits with these rifles. The AR-15 has found a true home with the American sportsmen, due in a large part to its increased accuracy and flexibility developed in recent years.



The AR can be a do-all 400-yard platform, including its use in total stealth. Can't ask for much more in the field when sport hunting.

As part of my AR review for this book, I selected four of my current test guns for detailed examination, especially in judging just how close these civilian rifles are to the military variants.

The first of these examples is the Bushmaster Varmint, which has a digital tan and brown camo pattern painted onto the rifle, a four position fore-end with Weaver mounting rails, fold-down auxiliary battle sights, six-position buttstock, flat-top receiver with a Weaver rail for additional sights or optic, and an "Izzy" bird cage-type flash suppressor/muzzle break. This rifle is chambered in .223 Remington/5.56 NATO.

Rifle No. 2 is my personal S&W M&P15 set up as a short, M-4-style AR. This rifle mounts a quad fore-end with a Weaver mounting system for lights and sights, a six-position buttstock, folding battle sights, ladder guards over the fore-end rail, and a bird-cage flash

suppressor. The receiver is a flat-top designed for all types of sights on a Weaver rail, and the sights on this rifle are Trijicon's ACOG red dot "doughnut"-style optic with a 4x magnification (this is the current U.S. Army battle sight).

The third rifle is a double deal of sorts. The upper is an AAC Advanced Armament Corp., system, while the lower is a Stag Arms development. This rifle is Mil Spec and chambers the newer .300 AAC Blackout. Shooting the also new Barnes TAC-TX bullet, this addition is, in my mind, a match to the Russian AK-47, but with a much better bullet; it's bound to see strong use among varmint and medium-range big-game hunters.

The last rifle is a Stag Arms Model 6 Super Varminter. It retains a flat-top receiver with Weaver rail, left- or right-hand controls, a 24-inch, stainless steel, match grade 1:8 heavy barrel (.223 Rem.), tubular free-floating handguard, M-16 buttstock with storage matchbox plate, and a flush-mounting 10-round magazine. It is accurate to ½-MOA at 100 yards, thanks at least in part to the new Federal/ATK Nitrex 6-20x50mm scope paired with Grand Slam extra high steel rings.

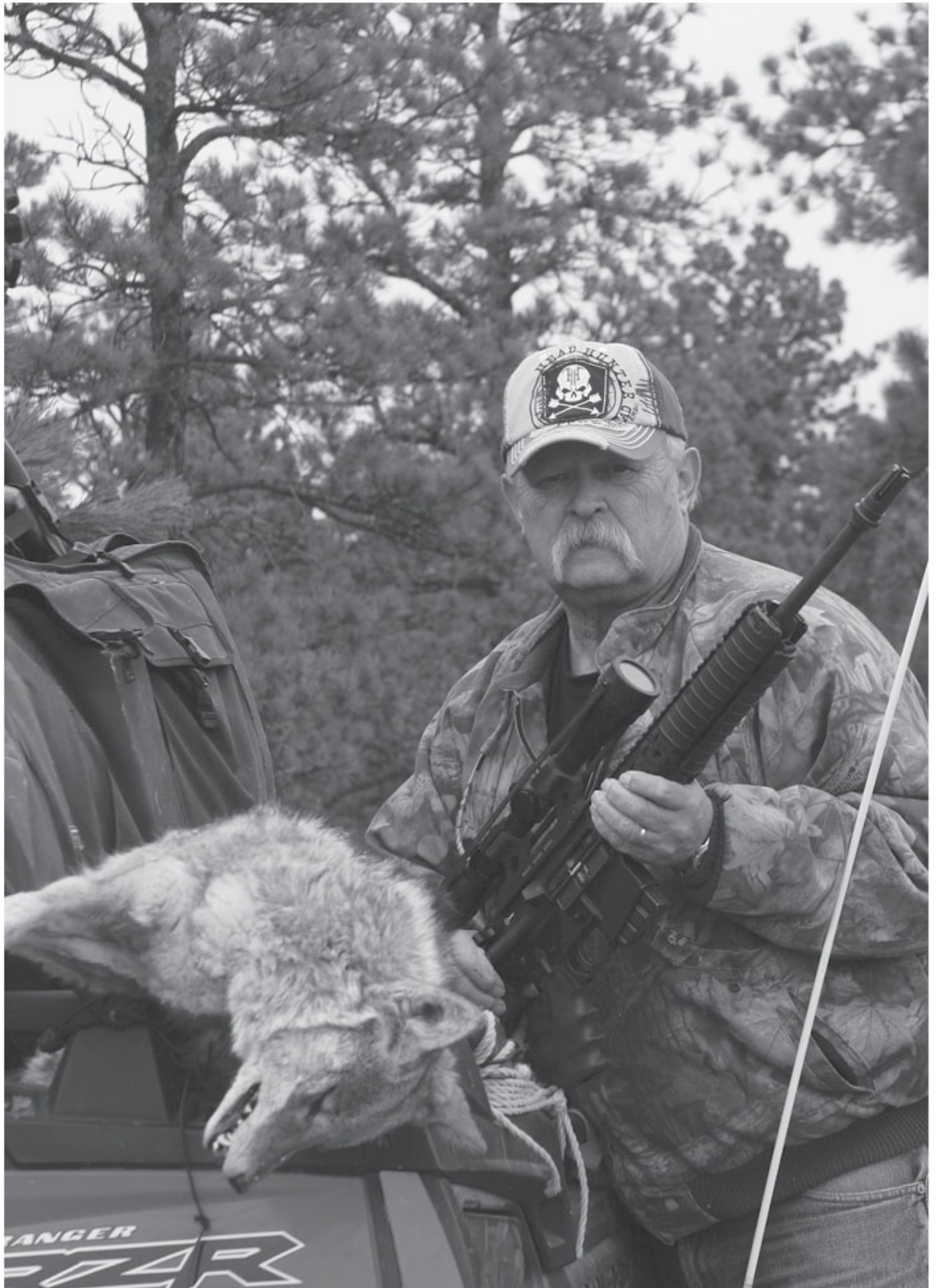


Where do military M-16s fall into these four gun profiles? About dead center. The S&W is all but a standard military general combat rifle, save for the model designation. The Bushmaster is getting close to the new M110 sniper rifle being built by Knight Arms, a top replacement for the M-24 bolt-action rifles used by U.S. Army snipers. The M110 uses a fully suppressed barrel for sound reduction, but no big deal there, as I am having a Gemtech suppressor built now for my S&W, to be used here in South Dakota. (Quiet shooting saves ears. Our European friends have known that forever, but we are still living in the dark ages on this side of the pond.)

In the ultra long-range rifle department is Stag Arms .223 Rem. It has all the target upgrades to make the grade to perfection. Once upon a time, a rifle in an AR configuration that gave this kind of

accuracy and dependability ran about \$3,000. Today, this rifle will cost the hunter or target shooter about \$1,100. That's a big change, and it shows to both the acceptance of these rifles and the demand for them. One thing that's interesting to note is that Stag Arms has been involved in Mil Spec parts production for government contract work for years. Only as of this past year has this company decided to build its own complete rifle, and quite a good rifle it is.

Almost everything observed in these new rifles has come down the pike over the past five to seven years. That's a timeline of only a minute, by engineering standards, and we ain't done yet. AR-class rifles as sniper rifles or fast-handling hunting tools can take down five targets that are within somewhat close proximity in under five seconds flat—a turn-bolt gun will require more than double that amount of time and sometimes more.



This past winter I fired my S&W M&P15 a total of five times outside of paper target work. I killed a trophy gobbler, two coyotes out to 335 yards, and two raccoons. Number of missed rounds via that military ACOG Trijicon sight? Zero.

While I do indeed believe the new SOCOM SCAR is the rifle that will see the hands of the next generation of American war fighters (it has already been moved into service with some specialty units), the AR rifle is not about to go away anytime soon.

IS THE BOLT DONE?

As dominating as the semi-auto AR-type platform has become, don't think for a moment that the turn-bolt rifle has just gotten up and gone away. Nor will it. The bolt gun is far from a dead tool on the battlefield (let alone the hunter's hands), and, today there are more offerings in "tactical"-type bolt-action rifles than have been offered at any other time.

Now, seven years after writing the first edition of this book, I wanted to get a better handle as to just what really new in bolt-actions—and what I found was nothing but *awesome*. One such example is the new Kimber Model 8400 Advanced Tactical sniper rifle. Kimber has built this tack-driving, long-range bolt gun on a fully adjustable McMillan sniper stock, added a medium-heavy, super-accurate barrel, then topped it off with a Leupold 3.5-10x Mil Spec M-4 sniper scope. This scope utilizes $\frac{1}{2}$ -MOA clicks, versus the standard $\frac{1}{4}$ - or $\frac{1}{8}$ -MOA adjustments, and it is calibrated to the 7.62 NATO (.308 Win.) to 1,000 yards. After a dead-on 100-yard zero, the rest of any needed elevation adjustments are taken up by the scope via a simple dialing to the exact range of the target. For instance,

500 yards requires only a turn to the "500" marked on the scope turret; the 168-grain Sierra MatchKing boat-tail does the rest. When I talked to people at Kimber about the new rifle, I was told the major sales were coming from the non-military/LE market. Certainly, some of these sales were to professional private contractors fitting out their gear for assignments in the Middle East, but still, you have to realize that quite a number of just us average guys are using these high-grade setups. Kimber also offers this outstanding rifle in a .300 Win. Mag. Currently, the 8500 Advanced Tactical is backordered quite a ways out. Kimber can't even stay close to production requirements for this rifle, due to the fact that it's hand built one at a time, versus being a production line model.

There is a long history of American sporting cartridges and firearms ending up in the military's hands, just as military hardware ends up being used by the sport shooting public. For instance, at the start of the Vietnam War, the U.S. Marine Corps turned to the sporting goods store, off-the-shelf Winchester Model 70, when putting together the first sniper teams needed since W.W.II. At the time, there simply weren't any long-range sniper rifles in the military's inventory. Today, cartridges developed for big game, such as the .300 Win. Mag., 7mm Rem. Mag., and .338 Lapua, have crossed over into the military market. Circular as it is, and while it may well truly be that no good may come of war, civilians and military/LE are today enjoying the best in long-range rifles and ammunition, both thanks to the other.



The author after taking the Kimber Advanced Tactical bolt rifle through its paces.

ARS FOR VARMINTS: TWO DEADLY COMBINATIONS

Badgers are critters that just don't give a rat's tail about much of anything. Anything that could possibly scare the daylights out of a man or other beast does not seem to rough the hair on a badger's

back much at all. Fearless as they are, hunting these critters becomes an art form.

Many times, while meeting new writers, engineers, and other ballistic types in the field, I quickly learn that they have never confronted one of these killing machines, let alone taken a shot at one. That's because, even with their size, which can range from 11 to 50 pounds, this ground-burrowing animal can be quite elusive. When you do find one, they can be extremely tough to put down.

I once watched a hunter with a .22 rifle put 15 rounds into a big, adult male badger at point-blank range, while the animal took hold of his rifle barrel and pulled it away from him. I myself have been charged by this low-built, four-legged set of sharp teeth several times out on the wide-open prairie. When I stopped the last one I met face to face, my S&W M&P AR-type rifle, loaded with 55-grain V-Max Hornady fodder, sent blood spatter all over my new clean shirt—yes, the confrontation was just that close. After that short burst of gun fire, the badger hissed at me a good deal, then quickly turned and got down into his den. Hell, man, that animal had at least four bullets in him and *still* left the scene of the crime. The bottom line here is that a badger is not to be taken lightly when confronted and, as such, be sure of your kill shot and check closely for a stone dead critter before taking any high-five hero shots with that cell phone camera.

A story's in order here, and it starts in that home base of mine for gunning varmints, the east-central area of Wyoming, where I have a massive cattle spread on the western slope of the Snowy Mountain range to work with. This is coyote, ground squirrel and, yes, badger country. Badgers are about as common as woodchucks are back in the Eastern states, and that is because the state of Wyoming doesn't

allow general varmint shooting for the big gray critters. However, permission can be given by private landowners to shoot them, when control measures are required. I believe that, because of this law, the badger has many areas of the state where it replenishes its numbers, when controlled shooting has reduced them in a few other areas. I have hunted the western slopes of the Snowy Mountains for more than a decade, now, and I have not seen any tangible reduction in badger sightings, which tells me that populations are managed well and properly.



The elusive badger is a ferocious creature to encounter up close—which makes it an excellent candidate for long-range rifle applications.

On this hunt, I was forced up once again on the old Silver Spur, a ranch near Encampment, Wyoming. The Spur offers clean beds,

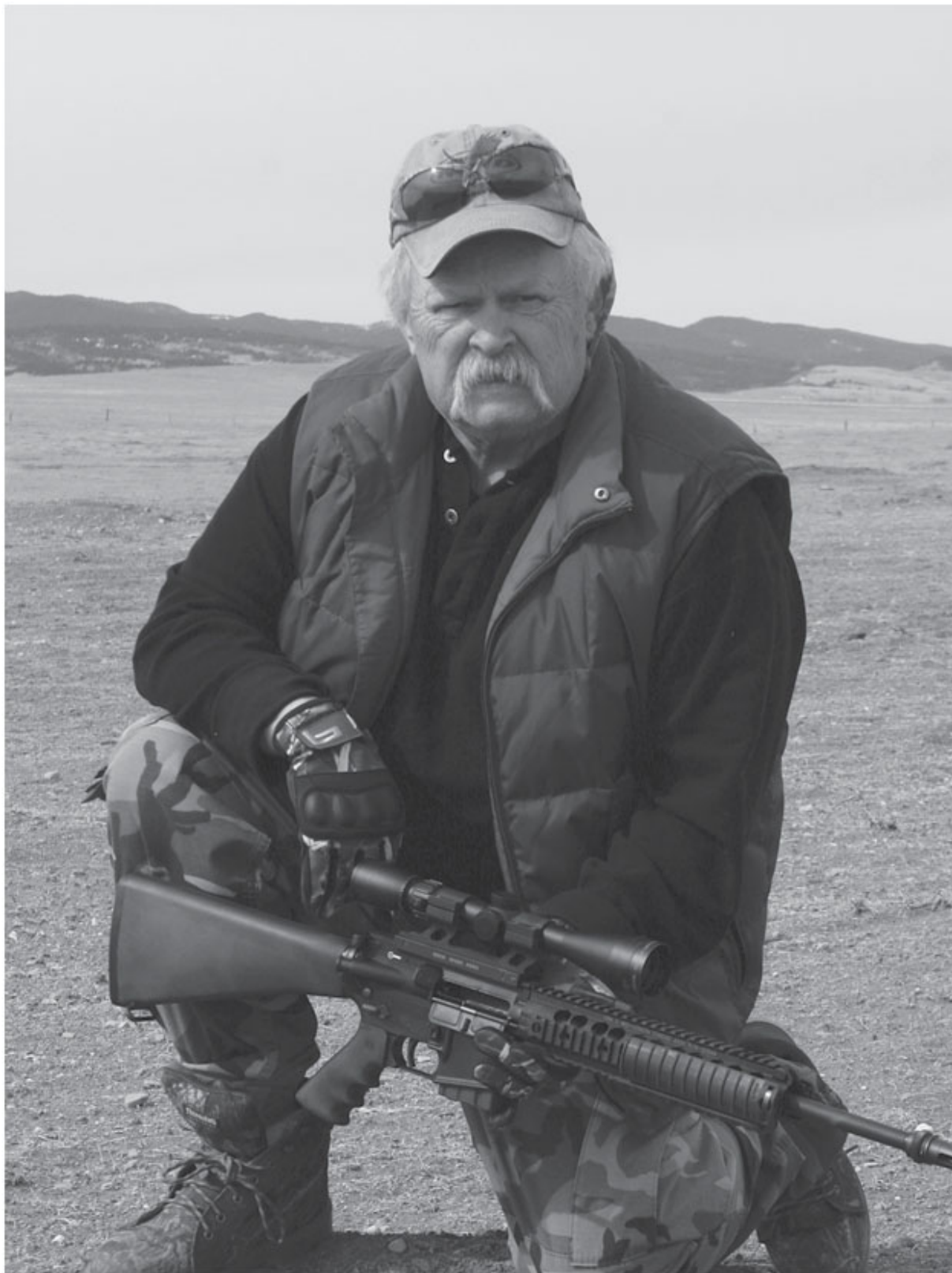
home cooking of the first order, guides if required, and a massive amount of open rangeland to hunt. In the fall, it is a deer or elk camp, while later in the year it's a fly fishing camp and varmint hunter's paradise. This time around, I was hunting with my friend Matt Rice, a representative of both Smith & Wesson and Thompson/Center Arms. Tack on some help from Hornady, with vast quantities of ammunition at a time when it is indeed hard to find, and you have the makings of a grade-A varmint hunt. On my radar: badger.

The Spur is an active cattle and horse operation and, as such, badger dens can become quite an issue. Heck, we fell into one with our 4X4 on the first morning of the hunt, a hole big and bad enough it almost required a winch to pull us free of the trap in the soft sand. Get a cow into this mess and, undoubtedly, a broken leg, and a six-gun start to come into play. Not a good ending for quite a few hundred dollars worth of meat on the hoof.

Rifles for badger are the same one we tend to run out for most varmints, save for the fact that the big .30-caliber and larger bullets don't leave a whole lot for the skinning bench or hero pictures after the hunt. In this case, however, I'd elected to shoot the S&W M&P15 Sport, an M-4 platform carbine in .223 Rem./5.56 NATO dressed down to the basics, but a deadly accurate weapon bar none. This new rifle uses a melonite bore coating versus chrome, and it has proven to cost less as a manufacturing process without sacrificing bore protection needed for use with high-velocity bullets. The M&P15 Sport retains no forward assist, a common deficit with many of today's AR-type rifles. It features your basic fore-end, but mounts a six-position butt stock. Accuracy was very good. At 100 yards, during our zeroing morning, some cloverleaf groups were common, and

stretching that accuracy was a cinch, thanks to the Weaver varmint scope equipped with Mil Dots. Best part of this gun? It retails for not much more than \$800. I liked this rifle enough to shoot it for more than half the hunt, and I was in camp for a full week. It was this extra time afield that helped bring down those elusive badgers.

Ammunition for our week-long hunt consisted of loads in the newer Hornady "Superformance" rounds. These loads made use of the V-Max bullet, pushing them downrange at an average increased velocity of 200 fps over conventional loadings by other makers. In addition to their extra speed, these high-performance rounds tend to control muzzle blast, heat buildup, and bore fouling. Accuracy through both the T/C bolt guns and S&W M&P15s was outstanding, something that certainly aided in sending several badgers to the big sandbox in the sky (or wherever dead badgers go in the next life).



A quality AR rifle and scope combination is a handy tool that will handle most varmints out to extended ranges.

With the vast expanse of geography we were hunting, making use of quality spotting scopes, ranging binos, individual rangefinders, and solid varmint rifle scopes was essential. Sure, some shots were about point-blank, but, on other occasions, you could find yourself sitting on a ridge and glassing across a valley to the next range of rocky ridgelines. Without ranging equipment in hand and good optics, on those latter occasions, you're both dumb and blind when it comes to locating targets. (Of course, this goes the same for the deer hunter, elk hunters, or fur takers during their seasons in the same kind of environment.)

The first badger was encountered as Matt rolled the truck over some of the ranch's two tracks, in search of prairie dogs. On this hunt, we had a number of very young writers who had never dusted off a dog before, so this was a critical mission of sorts. I, on the other hand, being the old guy with about 5,000 prairie rat kills to my record, took the opportunity to scan the field edges and brush-covered draws with my writer camp-issued Weaver bino.

Driving around a tight curve and coming out to arrive on a more elevated piece of ground, I spotted a gray badger alongside its den hole and about 90 yards downrange. And then he was gone. No sooner had we hit the brakes than the big devil was down the hole, apparently not caring to start a fight that day. I told Matt that I was bailing out and moving to higher ground to wait out the critter, taking along shooting sticks to cradle the M&P15.

Badgers are curious animals, and I have thumped many of them when a bit of time has passed after an initial duck for cover. Thinking

all is clear, they will reemerge to go about their badger business, giving way to a clear shot.

Scooting away from Matt's departing truck, I positioned myself well above and about 265 ranged yards from the den of the critter. It was a dirty sniper's trick, but it seemed to work quite a bit of the time. After the last faint noise from Matt's rig had drifted away on the wind, sure enough, up came my fat gray target. Settling down behind the tactical Weaver glass, I set the reticle on the badger's neck and turned loose a single 52-grain bullet, sending hair flying into the wind and forming a bathtub-sized cloud of dust. When the dust cloud dispersed, it was plain to see that badger No. 1 had met its fate. I was off to a good start in the business of taking on those Wyoming critters.

The second kill came as a double, but not my doing. Several of the young hunters with our group had come up on a trio of badgers moving out onto a short-grass hayfield, something you don't see them do very often. When those writers' traveling rig came over the top of a hill, two of the animals were caught dead in the middle of a several hundred-yard expanse of grass. I didn't see the shooting, but I guess it could have been a bit better orchestrated. Let's just say that two badgers eventually lost the fight, but it was not at all due to pretty shooting.



The author found the Smith & Wesson M&P15 to be highly effective on notoriously tough Wyoming badgers.

CHAPTER 6

THE SUPER BORES



Larry Crawford making a major switch to the Viper .50-caliber rifle. As Larry stated, “This is no .218 Bee, for sure.”

THE ORIGINAL SUPER GUN, the .50 BMG (Browning Machine Gun), is a throwback to WWI. Yes, that’s correct, WWI. When the Germans developed the first antitank rifles to be used against British tanks during that first Great War, our own John Browning modified the German .55-caliber round into his now world-famous cartridge.

Despite its massive size, this round has the same baseline dimensions as the good old .30-06 Springfield. With the .30-06 being the Jack-of-all-trades in the days of the .50’s development, it was quite natural to take a look at

designing the .50 BMG around the sporting round's basic case dimensions. The design proved to be a darn good one, because we still use the big .50 BMG in our heavy machine guns today. Indeed, little from that first gun has changed, save for the exception of mounting it on much newer vehicle designs.

With the Korean War, the .50 found a new application as a single-shot sniper's tool. By the time Vietnam rolled around, the round was seen as a serious threat by the enemy, as our gunners dusted them in the open from 1,000 yards or better. Information I've been afforded also indicates that this gun has cleaned out the bad guys in Afghanistan, to distances as great as 2,200 yards, with verified one-shot stops, for a real morale breaker among the enemy.

Today, with the exception of the state of California, which bans its use, the big .50 has built a real following as an ultra long-range target rifle and critter-control tool. Nothing except for an antiaircraft gun can match or beat its muzzle velocity and sheer power. No, the "Ma Deuce," as it has been called, is the ultimate long-range rifle and, since federal law prohibits cartridges with a bullet diameter larger than .500-inch, the .50 BMG is as big as we're ever likely to get for civilian use.

• • •

The Blue Grass Viper I shoot takes up the entire bed of my Toyota Tundra, when I go afield with her. She has a name—"Ms. AT&T"—and getting her set up on a prairie dog town takes a good deal of effort. Far from being a run-of-the-mill target rifle, any larger and it would be classified as towed artillery.

I first got my hands on the big .50 BMG during a writer's event at Pasa Park, Illinois, some years ago. We were testing a new .30-caliber Hornady bullet through ordnance gelatin on an 800-yard range and, by chance, I

arrived just about the time the folks at Midway were unveiling a McMillan turn-bolt, box-magazine .50-caliber. Well, it didn't take much coaxing for me to climb behind that big rifle and chamber a round of 650-grain ammo. As everyone cleared the area and double-checked their ear protection, I touched off a shot at a 600-yard block of gelatin, all of us watching as the block jumped up and then back with the impact of the big bullet striking close to dead center.

At the shot, some extra rounds on the bench were blown over my shoulder, and some of the white paint on the roof flaked off to drift down like a small snowstorm. I guess you could say that I was more than a bit impressed with this very big and effective unit of firepower.



A VarTec scope mounted to Viper .50 via the Weaver rings and rail system. This system held tight in the heavy recoiling rifle during a full month of extensive shooting.

Now, I've shot everything from an English 4-bore commercial market hunter's duck gun to the hammering .416 Remington Magnum, and I've produced a good deal of work with many 10-gauge heavyweights over the years. At times, those big shotshells were capable of delivering as much if not more punishing recoil than the .50 BMG. In fact, I have to say that the .50 BMG is a bit *overrated*, in terms of recoil. I'm not saying that the big gun is to be taken lightly. This cannon does deliver some massive energy, but it is tolerable and, after a bit of time behind the rifle, reasonably easy to accept.

Shooting the .50 BMG is, without question, a whole lot of fun. After you start to shoot one, you want to shoot more. It just commands attention. So let me give you some tips, in the event you decide to try the big .50 BMG.

First of all, when you scope the rifle, allow yourself at least a three-inch clearance between your eye and the rear of the scope. Recoil can be enough to bounce this tube off your skull, and that's gonna leave a mark.

Second, shoot from a solid benchrest. Shooting prone is useful and quite workable, but getting used to the muzzle blast and recoil is better done in the sitting position, and your upper body can flex with the shot better.

Zeroing a .50 BMG is an art form. When I scoped my Blue Grass Viper, I elected to mount a Ramshot VARTAC 4-14x varmint/tactical tube that featured completely open turret adjustments and parallax dial-in controls. At first, I simply removed the bolt and bore sighted the scope using the big ½-inch bore and crosshair alignment against a 25-yard mark I'd placed on a pine tree near my house. This method tends to be accurate with smallbore rifles, but I knew I was only going to get close with the .50, as the big hole in the barrel left a good deal of slop from side to side, as I directed it at that white spot on that tree.

After completing a basic bore sighting, I took the rifle to a prairie range east of Rapid City, South Dakota. This range was on the Buffalo Gap National Grasslands, so, if a bullet did get away, it could travel for miles and not hit anything but mud, snakes, or a very unlucky coyote. Using a benchrest some nice folks had built years ago, I set up a portable Champion target standard that held a 3x3-foot piece of cardboard and a zeroing target, the target placed 50 yards downrange. If I was going to miss the center, at several dollars a shot, I wanted to at least find the hole on the paper.

Using a set of Caldwell shooting bags while keeping the bipods folded under the barrel, I proceeded to load the big Viper single-shot, drop the safety (it goes on automatically as you close the bolt), and then pulled the buttstock into my shoulder. At the shot, the earth 25 yards behind the target came *unglued*, though, thankfully, in a nice, tight, direct line with the target backer. I could easily see the big ½-inch hole a bit left and high on the paper.

I proceeded to do a whole lot of spinning with the scope's knobs, as the graduations were in ⅛-inch increments, versus the ¼-inch clicks found on many scopes. After turning the turret knobs for what seemed like forever, I set up for a second shot, but this time pulled away the bags, dropped the bipod, and put one small sack under the buttstock to adjust for elevation; the first shot told me recoil from this light .50 was manageable.

The second round felt good, as the rifle rocked back, but the target showed I needed another adjustment to the right and a few clicks down to hit my chosen zero of 1¾ inches high at 50 yards. With that second turning of the windage and elevation knobs, the third shot went straight home, and I now had a baseline zero that would allow me to move the target out to the 200-yard backer.

At 200 yards, I moved up my magnification to 10x and promptly dropped a well-centered but low hit on the bull's-eye. It would seem that, according to my ballistics tables, an additional elevation correction for a 200-yard zero was required. Anyone who thinks that the big .50 BMG won't drop as it travels is living in a dream world. This massive, 650-grain bullet drops like a rock, but it can fight wind and maintain momentum very well, making it one of the best possible 2,000-yard rounds in use today.



The big .50, in this case the McMillan turn-bolt, tends to draw a crowd on any range.



Brezny checks his zero target via the Viper .50 BMG, during the mounting of the VarTac scope.

With the rifle zeroed, it was time for my wife, Colleen, a very capable spotter, and I to head for the Badlands in western South Dakota. This was stretch day for the .50 BMG, and I would be using it to shoot everything from long-range mud buttes to some paper targets out on the empty and vast wastelands toward the Missouri River country.

As I set up the Viper on a CaseGard bench and buttstock bag rest, Colleen stood back with a 10x42 Cabela's Euro binocular and locked onto a slim butte that stood about 15 feet high in a flat wash. Behind the butte was a sharp ledge that would catch a bullet in the event I sent one over the top of the butte. It must be understood that the .50 BMG has a 7,000-yard effective range, in terms of inflicting damage. Each shot must be planned with care at all times.

At the shot, Colleen jumped straight up, seeing not a thing through her bino. I, on the other hand, had seen a dust trail drift off the butte, as the scope settled back. I glassed the surface of the tall mud pile, searching for the bullet impact on the 438-yard target. Dead center. Exactly where I had

aimed was a three-inch hole, smack in the center of the butte's face. My aiming point established, round two was also sent into the butte, and the hole only got larger. Time for the next test.

Heading for Greg Iversen's ranch, where the local prairie dog population needed thinning out, I met several friends there the following Saturday morning. The day was warm and clear, but we had a stiff crosswind. Larry Crawford had arrived early and had gotten off some close-range shots with his neat little .218 Bee in a hand-built, Martini-action single-shot rifle. Even though long-range shooting is a challenge, getting a tight-shooting little centerfire rifle on target can be a real blast as well, and it was obvious that Larry had been having a good start to his day on the dog patch. My two other partners, Tom Hansen and Kevin Janish, had also pulled up near the big dog town, and I arrived just as Tom was unloading a small portable bench that allowed him to "walk" the towns quickly. Larry and I, meanwhile, set up more static tables and rests.

We played with some other guns for a bit, but, with the winds continuing to pick up, we soon laid them aside. By the time the switchgrass was being blown flat against the ground and dust devils were starting to swirl overhead, I figured it was about time to go for the heavyweight during the final few minutes of the morning's shoot. Setting up the big .50 on my bench, I located a dog at a ranged 397 yards. With the upright critter in my VARTAC scope and the crosshair center set and eight clicks up (from an advanced zero of 300 yards), the .50 BMG cracked and the grass rat simply disappeared. Tom told me he could feel the drafting concussion of the muzzle brake out to the 130 yards, where he and his spotter were set up.



Tom Hansen doing the shooting and Kevin spotting the shots downrange. Shooting as a team can be a big help when pushing bullets to their limits.

The Blue Grass Viper weighs 24 pounds less the varmint scope and unloaded. Each round weighs a quarter-pound. The big rifle has a long Weaver/Picatinny rail that will allow a scope to be positioned far away from the shooter's eye. I used standard Weaver rings on my system and, to date, they've held their ground well. In all honesty, I don't believe the .50 Viper generates any more recoil from the bench than my Remington 870 12-gauge slug gun. In fact, it could well be less, even though the gun's report is unsettling and takes some getting used to. Still, with an overall length of 57 inches, including its 32-inch barrel (less the muzzle brake), the Viper is a handful to move around. (I should add that the folks at Blue Grass Armory were one of the only .50 BMG companies to stay on task and get a gun to me for this book. In other words, these folks were willing to hang their product right out for all to see. Many thanks to the folks there, as they have contributed greatly to the overall development of this book.)

I headed next to Hulett, Wyoming, and H-Crown Outfitters, for additional gun time behind the Viper .50 BMG. H-Crown has space, a safe environment for big guns like the .50. There I shot several old, well-known dog towns, but, due to poor weather conditions I didn't get the data I was searching for. What I wanted to do was push the big 650-grain bullets out to nearly 1,000 yards. You need spotters for this kind of shooting, due to the big .50's recoil and target blackout. I was starting to see targets with bullet impact beyond 400 yards at times, but it wasn't consistent and, with ammo costing \$2.75 to \$5.00 a pop, I wanted data on as many rounds as possible, so I headed back to Harding County and Randy's place once again.

With the big .50 in place for long-range targets out over those Badlands buttes, Randy came along to be my iron-eyed spotter. Target selected, agreed on, and ranged via the Swarovski LG, the .50 BMG was put to work once again. Using the first Mil Dot on a 538-yard, round gray rock halfway up the side of a butte, the .50 just *smoked* the ledge and the rock was gone. In its place was a gaping hole about the size of a coyote's body. Pushing to a ranged 731 yards and targeting a red oval rock midway up a shallow rockslide wall, I was disappointed to see my next shot go three feet low. With the shot called and confirmed by Randy, I corrected the gap with some additional holdover and sent another round downrange. *Wham!* and the rock now stood out with its center missing. My final shot pushed the .50-caliber to 819 yards, and a third rock died.



Larry Crawford shooting the small but effective .218 Bee in a high wall custom rifle of his own design. Long range can, at times, mean shooting something less than the big guns.

Try as we did for the super long shot, we just could not get dirt to fly or rocks to die at the 1,000-yard mark, but I still drove away from that ranch satisfied that I had hit things farther out than I had at any other time in my history as a rifleman and gun writer. Lots of fun, to be sure.

BASIC BALLISTICS: THE BIG GUNS

With the greatly appreciated help of ballistics experts like Ross Metzger, of SHOTdata Systems, and Tom Burczynski, the top gun at Experimental Research, I have been able to develop some ballistic tables for both the .416 Barrett and .50 BMG. These tables will allow the reader to understand the

performance of their big bullets downrange, and also allow the shooter to print out a workable quick reference drop table card for field use.



At least one bullet choice in Ronnie Barrett's .416 Barrett has a ridiculously high ballistic coefficient, which makes it a true long-distance powerhouse.

What you'll see with the charts on the .50 BMG (starting on page 139), is that, right off the bat, it is not a cure-all for getting on long-range targets. Drop calculations are a significant factor to be considered when shooting at long-range, and even a slight change in bullet design and ballistic coefficient will produce noticeable and often large changes in retained velocity and drop. For example, when taking a quick look at the table listing, the .50 BMG and a 647-grain bullet with a BC calculated at 0.6700, and using a drag function of G1, the full table can be studied in depth on your own. At a minimum, you can see that, at the muzzle, this round produces a velocity of 2,910 fps. At a reasonable zero of 300 yards, you have a velocity of 2,568 fps. That's a good deal of loss from its starting point, but ballistic science tells us the faster a bullet is moving, the greater its velocity loss over a given range. Less speed, less loss. No surprises here.

At 400 yards, the velocity of this pill has been reduced to 2,375 fps. Now it's just coasting along, but good old gravity is taking hold and pulling at the

bullet. The drop figure stands at 9.7 inches, enough to miss a prairie rat cleanly, lacking any holdover. At 500 yards, things are really going to pieces, in that the velocity has fallen off to 2,251 fps and the drop is getting to be a real problem at 25.6 inches. Remember the Rule of 400—even this round can't outrun physics.

Okay, but you can Mil Dot-compensate for a 25-inch drop, so what's the big deal? The big deal is that, over the next 100 yards, this steel football has dropped a full 48.4 inches and its velocity has fallen off to 2,131 fps—you have to *double* your holdover from the 500-yard mark. Push the range out to 1,000 yards, the often-hyped maximum “practical” range of the .50 BMG, and we have an astounding 226-inch drop and a velocity down to 1,688 fps. Speed is good, energy is still sufficient to knock out a vehicle, but that drop means a pile of calculations for getting a hit on the bad guy in the mountains of Afghanistan (or taking out a rockchuck in the Big Horn Mountains of Wyoming).

Now, change the bullet to one with a BC of .5010 and a muzzle velocity of 2,846 fps. The 600-yard drop for this bullet is now 57.4 inches with a terminal velocity of 1,849 fps, while, at 1,000 yards, the stubbier bullet has fallen 288.4 inches and has a velocity of 1,341 fps. That's a drop difference of more than 62 inches at 1,000 yards between the two bullets. Not that either is looking really good on paper at that distance, but that second bullet is falling farther than the height of a man, when compared to the first example.

Let's, for a moment, take a look at another tremendous cartridge, Ronnie Barrett's .416 Barrett. I ran this hot cartridge through the computer programs to see what would roll out the other end (see the chart accompanying this text).



Working with the smoking hot .416 Barrett round.

When this data was being generated, Metzger had a problem with the just about perfect BC associated with this round. At a figure of .934, it was hard for an old trigger-yanking ballistics guy to buy into that number. As he stated in e-mail after e-mail, “L.P., are you sure about that BC with the new Barrett .416 bullet?” Time and time again I reassured my good friend that,

indeed, that was the information I had been presented with, and that he should move forward with it and see what developed, in terms of some workable downrange drop tables.

Now, shooting the .416 Barrett with a more common BC of 0.546 indicates that this cartridge, with a muzzle velocity of 3,250 fps and a 300-yard zero, will drop its bullet 8.1 inches at 400 yards while retaining a velocity of 2,718 fps. That's a nice shooter for a medium long-range shot. After all, let's get real here: 400 yards, or four football fields, isn't any kind of chip shot. At 500 yards, this bullet has dropped 21.5 inches and is moving at 2,396 fps, still a hot round. Finally, push the range out to 600 yards, which even the big-time military gunners feel is long-range shooting, and you have a drop of 40.9 inches and a terminal velocity of 2,243 fps.

For comparison, just as I did with the .50, let's take a crack at the .416 with a hot BC of 0.943. With a muzzle velocity of 3,250 fps and a 300-yard velocity of 2,934 fps, this fast-mover comes into a 400-yard target at 2,833 fps and has dropped only 7.1 inches. That's not the big news, though, because, at 500 yards, the drop is still only 18.5 inches and, at 600 yards, 34.5 inches with a velocity of 2,639 fps—also the speed of a 180-grain .30-06 at the starting gate.



The author with a Noreen .50 BMG shooting 600-yard targets. This is a heavy gun and, so, a pleasure to shoot.

Moving out to 1,000 yards, the .416 Barrett is steaming along at 2,275 fps, with a total drop of 152.5 inches. That's 75 inches *less* than the first .50 BMG we calculated at the onset of this discussion. Taking all that math into consideration, what this should tell you is that the .416 is the go-to gun for taking out soft targets in a military setting. This super round is also one

heck of a long-range woodchuck shooter in Pennsylvania, and a marmot killer in the Rocky Mountains.

NOREEN'S LONG-RANGE .50

There's a trend developing around the use of very big guns to shoot at distances a very long way away. That trend is in judging performance by measuring in miles versus yards. Unfortunately, there's a lot of misinformation out there about the guns that do these jobs.

I am, without question, a follower of the .50 BMG as a civilian target and sport shooting firearm. During the writing of the first edition of this book, I took a good deal of one summer and spent days with the big .50 BMG in my Blue Grass Armory single-shot, in the Rocky Mountains of east-central Wyoming. You could say I was using a big gun in big country, and the whole thing fit like a good pair of shooting gloves.

Being an owner of a pair of .50s for quite some time, I have become clearly aware that information surrounding the super guns can be a long way from reality. Let's use my Noreen .50 BMG as an example. Built in Belgrade, Montana, the Noreen .50 is an off-shoot of a company known as Only Long Range/The Gun Room, LLC, which specializes in .50-caliber weapons, as well as .416s, .338 Lapuas, and other super long-range rifles. This company is also one of the only companies that offers a tightly fit, well-made .50 BMG single-shot at an affordable price—\$1,800 to \$2,300.

The rifle uses a short bolt that is removed from the breech with each and every shot. A large extractor groove is cut in the bolt face, and the cartridge is installed into the face in conjunction with the bolt. Alignment ensured, the whole thing—bolt and round—is rammed into the chamber at the same time. With the bolt handle in the up position, the rifle won't fire, thus acting as a safety.

As a non-military rifle, the Noreen not only works well, its costs are kept down. The bolt is hand lapped and blueprinted to the headspace of the individual rifle. There's a decidedly nice fit, easily observed when chambering an unfired round.

At the two sides of the receiver spring, recoil dampeners are installed. These are not pneumatic in nature, but are rather open springs that collapse against a stop as the stock moves slightly forward. Again, a direct and simple design that works, and it's unique to the Noreen .50 BMG.

With its extra-long 35-inch barrel, peak velocities are achieved with selected ammunition. Most of the loads I tested moved off the muzzle at 2,900 fps. Recoil with the 750-grain ball ammo tends to be quite close to a 12-gauge slug gun shot off a benchrest, and while the big, shark-fin muzzle brake takes up recoil, it will send a whole lot of heat and shock around and out from the gun's muzzle. All the way around, though, when moving this much copper and lead downrange at that kind of starting velocity, shooting fatigue sets in quickly. A morning of 20 rounds is a good deal of pounding, and, for me at least, my accuracy suffers after that.

The Noreen has a complete trigger and pistol grip group set up much like a very robust AR design and coupled with a high-quality, four-pound Timney trigger. I found no fight with the trigger whatsoever. Using some standard Weaver medium blocks and rings on the gun's Picatinny rail, a Konus Pro M-30 4.5-16x40mm was a good fit for the rifle. Like the gun itself, price is to be considered when setting glass atop a big .50, and I was pleased to see that, after its first day in use, all was still functioning and completely intact. I have been told that some scopes will drop their reticles in as little as two or three shots, and some have had their glass blown out of them. If there was an element of concern with the Konus, it was that unlike some major optics players in the military and police equipment business,

the Konus Pro M-30, with 1/8-click adjustments for elevation, would not have the elevation available for work beyond 600 yards.

If I was told it once, I was told 20 times during the past couple years that any .50 BMG that has a price point under \$3,000 is never going to be a reliable and an accurate gunning system. Well boys and girls, this is pure garbage talk. In fact, if anything, many of the fancier tactical designs are a bit overpriced. The Noreen .50 BMG is built with top-of-the-line parts, and almost all of it is handmade off a gunsmith's lathe. Everything down to the bipod is custom built from a single piece of ordnance steel and designed by the manufacturer to be an exact fit to its whole—that's right, there's no Harris bipod or any other generic part to this 38-pound gun.

Shooting from a benchrest at the 600-yard Buffalo Chip rifle range in Sturgis, South Dakota, I took the better part of a full summer to learn the rifle and its accuracy. The Noreen .50 was very predictable and, at 400 yards, when shot for accuracy, put all of her three-round groups inside a four-inch cluster. That, my friends, is a sub-MOA accuracy record, so goodbye to the naysayers.

STEYR'S H.S. .50

Moving into a higher price range, though still not into the upper limits, the Steyr H.S. .50 takes top honors. This rifle is built like all of Steyr's rifles and is a class act right down to the finish on the steel. The H.S. .50 is a single-shot takedown design that can be hauled around in its well-built rolling case. It had been indicated in some circles that the H.S. .50 has found its way into some military units that are not of NATO or U.S. origin. I can't state this for a fact, but my sources were believable to a high degree.



The Noreen .50 caliber.

One myth about the .50 BMG in a sniper service rifle is that it needs to be magazine-fed. Well, turns out not all the time. A rifle like the H.S. .50 is fast enough in its loading sequence to allow the shooter to get off the required rounds when needed.

For prairie rat shooting at a half-mile or blowing the tops off mud buttes in the Badlands, the H.S. .50 performs like a thoroughbred. Loading a single round after drawing the enclosed bolt to the rear, I found the action to be as smooth as glass. This rifle makes use of a massive muzzle brake, and, even at a loaded weight of 28.66 pounds, recoils less than heavier .50 BMG rifles. The reason for this is that the brake acts like a suppressor of sorts to dampen recoil, though, of course, no noise is eliminated.

Made from forged steel and special lightweight alloys, this rifle is a very mobile artillery piece. Note that I stated “artillery,” because the .50s seem to

be a totally different type of firearm, when put up against just about any target—you can miss a prairie dog at 500 yards, but you'll destroy his lodge in the process.

The Steyr H.S. .50 retains a 35.43-inch barrel with a 1:15 twist. This barrel is fluted for the first half forward from the receiver, then steps down to a round pipe out to the muzzle brake. A full fore-end is installed under the half-length of the barrel and is made from a polymer-based material. This same material also makes up the comb of the aluminum buttstock, which has a comfortable feel during firing. The trigger pull is at a fixed four pounds and very smooth, lacking any creep. In all, a typical, very well-built Steyr mechanical trigger.



Brezny at the bench with his Noreen .50 BMG.

The overall length of the rifle is 57 inches, but it handles like a much lighter, shorter piece. Indeed, compared to some others, it is very well

proportioned and has good weight distribution. This aids in good long-range accuracy.

Shooting a selection of Century International, military surplus, 750-grain .50 BMG, I found that the H.S. .50 clustered its 200-yard zero in a well-controlled, 1¾-inch print; I did experience the occasional flyer out to the five-inch ring. As the rounds were machine gun ammunition rather than match-grade handloads or special factory rounds, I felt the gun handled the budget-priced ammo well.

Shooting next at a range of 600 yards, I was able to make serious one-shot paper kills on Birchwood Casey's new tactical man-sized targets with ease. My glass sight was the Zeiss Rapid Z reticle and, as such, I didn't have to dope my elevation. Zeiss offers this outstanding, professional-grade scope that, over the course of shooting on two different .50s, has held up very well and delivered the mail without a hitch. Of course, as a scope with a price tag about the same as the rifle, it had better cut the mustard.

THE .338 LAPUA

It would seem that, every few years or so, a new super cartridge hits the long-range scene. At one point, way back when the .264 Winchester was king of the hill, there then came the 6mmx284, 6.5x284, 7mm Rem. Mag., and .416 Barrett. Some place in there the .408 Chey Tac also showed up, with the .50 BMG standing a bit alone as the player with staying power among shooters searching for hits a mile away. Today it is the .338 Lapua, and everyone that is anyone in the big-bore long-range business seems to be building a shooting platform designed expressly around this cartridge.



A 400-yard target after work with the Noreen.

The .338 Lapua came about because something needed to be designed that a sniper, while shooting a shoulder-fired weapon, could use to hold off an enemy mortar team or another sniper from a safe distance. The answer came from the parent case the .416 Rigby, a British big-game round that was necked down to .33-caliber, then strengthened for the task of lofting heavy 220-grain bullets to the ranges once thought to be safe zones by insurgent fighters. Ballistic data on this cartridge design from Finland, indicates that it will not go subsonic until past 1,500 yards (bullet and load dependent).

It could be stated that, if a shooter wants to really get into ultra long-range shooting and price or availability aren't issues, the super heavies like the .338 Lapua are the answer. There is no question that the .338 Lapua is king of the hill among more than a few target and other serious long-range

shooters. The big problem with the round is that it is attached to some very expensive rifles, and neither finished loads nor brass for reloading are in the low budget department, either. New brass for reloading will run about \$275 per 100 cases, and finished factory ammo can cost upwards of \$150 per 20 rounds. That's over \$10 per shot! I can feed my own .50 BMG for half that amount.

With the help of Federal Cartridge and Hornady, I was able to scrape together enough high-priced ammunition to gain an appreciation of the .338 Lapua afield. For the rifles, the folks at Weatherby were willing to put their heavy varmint turn-bolt Mark V on the line, as was Armalite, Inc., with its new AR-30 A1 "skeleton gun," a name I coined for these kinds of all-metal sniper/long-range rifles. For optics, Steiner got the call for a pair of very special long-range tubes. Mounted on the Weatherby was a Military 5-25x56mm. This scope retains a massive 35mm tube circumference. Inside was a unique sniper's reticle with a series of hashmarks set about like the U.S. Army's Mil Dot design. Also part of the reticle was the Russian-designed rangefinder calibrated to the average height of a man.

The Armalite AR-30-A1, this rifle got the Steiner 4-16x50mm Predator Extreme. This glass sight was certainly designed to reach out and put bullets on targets a very long ways off. With a reticle that makes use of hashmarks (much like Mils), it also has wind indicators at each range extension that would seem to correspond to about a 10 mile per hour drift.



Despite other up and comes, Brezny says the .50 is still king, bar none. Here he's shown with the big gun from Steyer, which boasts a muzzle brake that acts rather like a supressor and knockes down recoil (and obviously, not noise).

With a trip to eastern South Dakota, to work heavy machinery during the grain harvest, I decided to haul the AR-30 along for a shakedown. We worked very long hours in combines and chase tractors filling 18-wheelers day and night with corn, but we got break time, when a bearing went out on a pickup auger or some other breakdown came to pass. It was on those days that the .338 Lapua was put to work, as I ranged various targets out to 1,000 yards over those smooth rolling hills along the wide Missouri river. This was freelance shooting against boulders, deadfalls along the main river channel, and even lumps of mud in the river close to a mile away.

Like several other rifles I reviewed for this book, the AR-30 A1 by Armalite Inc., is a new and very current design making use of an all-metal platform that retains the barreled action and buttstock. Some of these stock configurations are called “tube guns” or chassis guns, but this AR-30 won't

exactly fit that profile. The barrel and action are atop an aluminum-channelled bed that runs the full length of the receiver and barrel. At the rear of the receiver, the buttstock is bolted to this frame. The result is a robust rifle that will not flex or change zero, due to varied weather conditions or handling. This rifle is built like a military spec weapon, and it shows it at every angle. With Harris bipod and scope attached, the rifle runs 18.20 pounds empty. It mounts a full recoil reducing muzzle brake, so I figured recoil wouldn't be a problem. I should also point out that I used a 12-screw double scope base and ring system on the full receiver/barrel-length Weaver-style rail. This rail rolls over the barrel to provide additional side rails and also makes use of two shorter sections that act as a short over-tube that allows the barrel to float through and out of the fore-end.



Steyer's bolt-action H.S. .50.



The standard version of the AR-30 A1 from Armalite, above, and the target version, bottom.



Steiner's 4-16 Military glass was used to move bullets at long range with accuracy. A deadly combination, as applied to this rifle and cartridge.



The Leupold M-4 holds up well under the huge recoil generated by the .50 BMG. You can't hit what you can't see, and that means big-bore rifles require good optics.

The bolt is a long-throw push feed, working over a removable box magazine. A latch safety attaches to the rear of the bolt (almost Mauser-style). The gun's pistol grip and snow trigger guard make for great control features, and the trigger is a very clean three pounds via my Timney trigger pull scale. One special feature that may seem small, but can save the owner hundreds of dollars, is the centered hole that runs the length of the buttstock and is aligned directly with the bore. This allows the shooter to remove the

bolt and sight down the bore for a 100-yard bore sight. At \$10 and change for each factory load you'll shoot, this can save rounds fired and many dollars. I have .50s that lack this advantage, and I have to rig mirrors at the rear of the action to produce the same effect. Believe me, my friends, when you're shooting these costly rifles, you get creative or pay the price.

For cartridges, I'll stay with a short list, but it's worth noting that the .338 Lapua has seen a good deal of action in both Afghanistan and Iraq, as an anti-personnel round with some limited barricade penetration capabilities; it is *not* a .50 BMG, when it comes to taking down block walls and killing the bad guys behind them at a half-mile. What it is can be best described as a mid-point round between the 7.62 NATO and the .50 BMG. There are exceptions, of course: A British Army sniper, Corporal of Horse (CoH) Craig Harrison, established a new long-range kill record of 2,707 yards against an insurgent. As a big-game round, there is nothing the .338 Lapua won't stop.



The .338 Lapua as loaded by Federal in its Premium line.

OVERVIEW OF SELECTED .50-CALIBER BULLETS

Barnes LRS Borerider

Weight: 750 gr. BC: 1.070

Barnes LRS Borerider

Weight: 800 gr. BC: 1.095

Note: A “solid” or monolithic bullet.

Barnes LRS Standard Throat

Weight: 750 gr. BC: 1.070

Note: A “solid” or monolithic bullet.

Barnes LRS Standard Tangent

Weight: 750 gr. BC: 0.766

Note: A “solid” or monolithic bullet.

Barnes X-Bullet

Weight: 600 gr. BC: Not available

Note: A “solid” or monolithic bullet.

AAA-Ammo “Harlow”

Weight: 705 gr. BC: Not available

Note: A “solid” or monolithic bullet. AAA Ammo bullets are neatly turned with a very fine finish.

Lost River Ballistic Technologies J40

Weight: 773 gr. BC: 1.06

Note: A “solid” or monolithic bullet. The J40 is also a turned bullet. The surface is a bit rougher than the Harlow, but consistent.

BASIC BALLISTICS: .50 BMG

Ballistics have been streamlined by author for ease of use.

Load: M33 Ball, .50 Cal., 647 Grs. at 2,910 feet per second
(military-spec load)

Elevation Angle: 0 degrees

Ballistic Coefficient: 0.67

Wind Direction: 0.0 o'clock

Wind Velocity: 0.0 Miles per hour

Altitude: 0 Feet with a Standard Atmospheric Model.

Temperature: 59° F

RANGE (Yards)	VEL (fps)	ENERGY (ft-lbs)	MOMENTUM (Lb-Sec)	DROP (Inches)
0	2910.0	12,163.5	8.36	0
50	2839.5	11,580.9	8.16	-0.52
100	2770.1	11,021.7	7.96	-2.12
150	2701.7	10,484.8	7.76	-4.85
200	2634.5	9,969.2	7.57	-8.77
250	2568.2	9,474.1	7.38	-13.95
300	2503.0	8,998.7	7.19	-20.44
350	2438.5	8,541.5	7.01	-28.32
400	2375.1	8,102.7	6.82	-37.66
450	2312.6	7,681.9	6.64	-48.54
500	2251.0	7,278.2	6.47	-61.04
550	2190.3	6,891.0	6.29	-75.26
600	2130.5	6,520.0	6.12	-91.29
650	2071.7	6,164.8	5.95	-109.24
700	2013.8	5,825.2	5.79	-129.21
750	1956.9	5,500.6	5.62	-151.32
800	1901.0	5,190.9	5.46	-175.71
850	1846.1	4,895.5	5.30	-202.5
900	1792.3	4,614.4	5.15	-231.84
950	1739.7	4,347.3	5.00	-263.88
1000	1688.2	4093.9	4.85	-298.8

[View a text version of this table](#)

Realizing the cartridge was going to go subsonic at about 1,600 yards, I decided to keep my field testing to targets inside 1,200 yards. This gave the round an edge over my .300 Win. Mag. to some degree and put it well beyond anything else in that big-game class of cartridges. What I really wanted to do was lock the zero and dope my sights across a valley that I intended to hunt a month later for trophy-class whitetail deer. I had dropped good whitetail bucks on this valley in five previous seasons, those kills ranging from 375 to 460 yards via my Weatherby .257 Magnum and an equally outstanding CZ American .300 Win. Mag. custom shop special. The .338's 220-grain bullet I was shooting was based on Federal's own 250-

grain Sierra MatchKing boat-tail hollowpoint and would be pressed downrange against cardboard and steel targets for the time being.

As it worked out, a call came from Armalite. There was a problem with the loaner .338 Lapua and it was being replaced by another in .300 Win. Mag. That had me turning to my second rifle, the Weatherby Mark V, for the remainder of my .338 testing.

Stocked in a sniper -style full composite stock and fitted with a fluted, pencil-like barrel, the Weatherby Mark V .338 Lapua is a mid-weight long-range rifle. Sure, the cartridge says long-range all over it, but this is a smaller rifle compared to others in its class and in this round. If the .338 were a better deer cartridge (i.e., if it didn't tear up a lot of meat), this would be a great static stand rifle shot from a rest or sticks.

US M2 .50 BMG BALLISTICS (1,000-YARD ZERO)

The following is the data for the standard U.S. M2 .50 BMG ammo. This is not the ammo to use if you're expecting any degree of good accuracy, but it will do just fine against hard targets out past a mile (1,600 meters).

Specifications: U.S. M2 .50 BMG, 709 gr., FMJ BT at 2,850 fps

Yards	Bullet Drop (inches)
100	-plus28.2
200	-plus51.9
300	-plus70.5
400	-plus83.6
500	-plus92.9
600	-plus89.3
700	-plus81.4
800	-plus65.0
900	-plus18.2
1000	Zero
1100	-49.8
1200	-112
1300	-191
1400	-288
1500	-404

US M2 .50 BMG BALLISTICS:

Wind Drift in Inches with 10 MPH Crosswind

Range	Drift
100	0.5
200	1.9
300	4.2
400	7.5
500	12
600	18
700	25
800	33
900	43
1000	56
1100	69
1200	84
1300	101
1400	121
1500	143

SHOTDATA CALCULATED BALLISTICS: .50 BMG

Projectile I.D.: .50 BMG

Drag Function: G1

Standard Atmosphere: 59° F.; 29.53" Mercury @ Sea Level

Std. B.C. = 0.701

Sight Over Bore, (Inches): 2

Zero Range: 300

Hit Above 0: 0.0

Cross-Wind (Mph): 10

Bullet-Gr.: 647.0 Speer FMJ

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)
0	-2.0	0.0	2,846	0.0000	11,639.4	0.0
50	1.3	0.1	2,780	0.0533	11,102.1	-0.5
100	3.5	0.4	2,714	0.1079	10,585.3	-2.2
150	4.6	1.0	2,650	0.1639	10,088.1	-5.1
200	4.4	1.8	2,586	0.2212	9,609.8	-9.1
250	2.9	2.9	2,523	0.2799	9,149.5	-14.5
300	0.0	4.2	2,461	0.3401	8,706.7	-21.3
350	-4.3	5.8	2,401	0.4018	8,280.9	-29.5
400	-10.1	7.6	2,340	0.4651	7,871.4	-39.2
450	-17.5	9.8	2,281	0.5300	7,477.8	-50.5
500	-26.6	12.2	2,223	0.5966	7,099.5	-63.4
550	-37.4	15.0	2,165	0.6650	6,736.3	-78.1
600	-50.1	18.1	2,108	0.7352	6,387.6	-94.7
650	-64.7	21.5	2,052	0.8073	6,053.3	-113.2
700	-81.4	25.3	1,997	0.8814	5,733.1	-133.9
750	-100.3	29.4	1,943	0.9576	5,426.6	-156.7
800	-121.5	33.9	1,890	1.0358	5,133.6	-181.8
850	-145.1	38.8	1,838	1.1163	4,853.7	-209.4
900	-171.3	44.1	1,787	1.1991	4,586.8	-239.6
950	-200.2	49.8	1,736	1.2843	4,332.7	-272.5
1000	-232.0	55.9	1687	1.3719	4091.0	-308.4

[View a text version of this table](#)

Projectile I.D.: .50 BMG

Drag Function: G1

Standard Atmosphere: 59° F.; 29.53" Mercury @ Sea Level

Std. B.C. = 0.6700

Sight Over Bore, (Inches): 2

Zero Range: 300

Hit Above 0: 0.0

Cross-Wind (Mph): 10

Bullet-Gr.: 647

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)
0	-2.0	0.0	2,910	0.0000	12,168.8	0.0
50	1.2	0.1	2,839	0.0522	11,586.0	-0.5
100	3.4	0.5	2,770	0.1057	11,026.5	-2.1
150	4.4	1.0	2,702	0.1605	10,489.7	-4.9
200	4.2	1.9	2634	0.2167	9973.4	-8.8

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)
250	2.8	2.9	2,568	0.2744	9,477.9	-13.9
300	0.0	4.3	2,503	0.3336	9,002.0	-20.4
350	-4.1	5.9	2,439	0.3943	8,545.0	-28.3
400	-9.7	7.8	2,375	0.4566	8,106.3	-37.7
450	-16.9	10.0	2,313	0.5206	7,685.3	-48.5
500	-25.6	12.5	2,251	0.5864	7,281.5	-61.1
550	-36.1	15.3	2,190	0.6539	6,894.2	-75.3
600	-48.4	18.4	2,131	0.7233	6,523.1	-91.3
650	-62.6	21.9	2,072	0.7947	6,167.8	-109.3
700	-78.9	25.8	2,014	0.8682	5,828.0	-129.3
750	-97.2	30.0	1,957	0.9437	5,503.4	-151.5
800	-117.9	34.6	1,901	1.0215	5,193.5	-175.9
850	-140.9	39.7	1,846	1.1016	4,898.2	-202.8
900	-166.5	45.1	1,792	1.1841	4,617.1	-232.3
950	-194.8	51.0	1,740	1.2690	4,349.9	-264.5
1000	-226.0	57.3	1688	1.3565	4096.4	-299.7

[View a text version of this table](#)

Projectile I.D.: .50 BMG

Drag Function: G1

Standard Atmosphere: 59° F.; 29.53" Mercury @ Sea Level

Std. B.C. = 0.5010

Sight Over Bore, (Inches): 2

Zero Range: 300

Hit Above 0: 0.0

Cross-Wind (Mph): 10

Bullet-Gr.: 647

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)
0	-2.0	0.0	2,846	0.0000	11,639.4	0.0
50	1.5	0.2	2,753	0.0536	10,893.4	-0.5
100	3.8	0.6	2,662	0.1090	10,187.0	-2.2
150	4.9	1.4	2,574	0.1663	9,517.4	-5.2
200	4.7	2.6	2,486	0.2256	8,883.2	-9.4
250	3.1	4.1	2,401	0.2870	8,282.5	-15.0
300	-0.0	6.0	2,317	0.3506	7,713.9	-22.2
350	-4.7	8.4	2,235	0.4165	7,176.0	-31.0
400	-11.2	11.1	2,154	0.4849	6,667.5	-41.5
450	-19.6	14.3	2,075	0.5558	6,187.6	-53.9
500	-29.9	18.0	1,998	0.6295	5,735.5	-68.3
550	-42.5	22.2	1,922	0.7061	5,310.2	-84.9
600	-57.4	27.0	1,849	0.7856	4,911.1	-103.9
650	-74.8	32.2	1777	0.8684	4537.5	-125.4

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)
700	-95.0	38.1	1,707	0.9545	4,188.6	-149.8
750	-118.2	44.6	1,640	1.0442	3,864.0	-177.2
800	-144.6	51.8	1,575	1.1375	3,563.0	-207.9
850	-174.5	59.6	1,512	1.2348	3,285.1	-242.3
900	-208.2	68.2	1,452	1.3360	3,029.5	-280.6
950	-246.1	77.5	1,395	1.4415	2,795.8	-323.1
1000	-288.4	87.5	1341	1.5512	2583.4	-370.4

[View a text version of this table](#)

SHOTDATA CALCULATED BALLISTICS: .416 BARRETT

Projectile I.D.: 416 Barrett

Drag Function: G1

Standard Atmosphere: 59° F.; 29.53" Mercury @ Sea Level

Std. B.C. = 0.5460

Sight Over Bore, (Inches): 2

Zero Range: 300

Hit Above 0: 0.0

Cross-Wind (Mph): 10

Bullet-Gr.: 400

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)
0	-2.0	0.0	3,250	.0000	9,383.9	0.0
50	0.7	0.1	3,157	0.0468	8,851.8	-0.4
100	2.5	0.5	3,065	0.0951	8,346.3	-1.7
150	3.4	1.1	2,976	0.1447	7,865.8	-3.9
200	3.3	2.0	2,888	0.1959	7,409.0	-7.1
250	2.2	3.1	2,802	0.2486	6,974.5	-11.4
300	-0.0	4.6	2,718	0.3030	6,561.2	-16.7
350	-3.4	6.3	2,635	0.3591	6,167.9	-23.2
400	-8.1	8.4	2,554	0.4169	5,793.6	-31.0
450	-14.1	10.8	2,474	0.4766	5,437.4	-40.1
500	-21.5	13.5	2,396	0.5382	5,098.5	-50.7
550	-30.4	16.6	2,319	0.6018	4,776.3	-62.7
600	-40.9	20.0	2,243	0.6676	4,470.1	-76.4
650	-53.2	23.9	2,169	0.7356	4,179.3	-91.8
700	-67.3	28.1	2,096	0.8060	3,903.4	-109.1
750	-83.4	32.8	2,025	0.8788	3,642.1	-128.4
800	-101.6	38.0	1,955	0.9542	3,394.9	-149.8
850	-122.1	43.6	1,886	1.0323	3,161.5	-173.6
900	-145.0	49.7	1,820	1.1133	2,941.5	-199.8
950	-170.6	56.4	1,754	1.1972	2,734.7	-228.8
1000	-199.0	63.6	1691	1.2843	2540.6	-260.6

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)
0	-2.0	0.0	3,250	0.0000	9,383.9	0.0
50	0.6	0.1	3,196	0.0465	9,072.5	-0.4
100	2.3	0.3	3,142	0.0939	8,770.2	-1.7
150	3.1	0.6	3,089	0.1420	8,476.7	-3.8
200	3.0	1.1	3,037	0.1910	8,191.8	-6.9
250	2.0	1.8	2,985	0.2408	7,915.1	-10.9
300	0.0	2.6	2,934	0.2915	7,646.4	-15.9
350	-3.0	3.5	2,883	0.3431	7,385.4	-21.8
400	-7.1	4.6	2,833	0.3956	7,131.9	-28.9
450	-12.2	5.9	2,784	0.4490	6,885.6	-37.0
500	-18.5	7.4	2,735	0.5034	6,646.3	-46.2
550	-25.9	9.0	2,687	0.5587	6,413.8	-56.6
600	-34.5	10.8	2,639	0.6150	6,187.9	-68.2
650	-44.4	12.7	2,592	0.6724	5,968.4	-81.1
700	-55.5	14.9	2,545	0.7308	5,755.0	-95.2
750	-68.0	17.2	2,499	0.7903	5,547.7	-110.7
800	-81.9	19.8	2,453	0.8508	5,346.4	-127.6
850	-97.3	22.5	2,408	0.9126	5,150.7	-145.9
900	-114.1	25.5	2,363	0.9754	4,960.7	-165.7
950	-132.5	28.6	2,319	1.0395	4,776.1	-187.1
1000	-152.5	32.0	2275	1.1049	4596.9	-210.1

[View a text version of this table](#)



Arma-Lite's big boys can be obtained as .50 BMG, .300 Win. Mag., or .338 Lapua.

**TRAJECTORY FOR HORNADY .510 DIA. (50 CAL) 750
GR. A-MAX
AT 2,950 FEET PER SECOND**

Elevation Angle: 0 Degrees

Ballistic Coefficient: 1.05

**Velocity Boundaries
(Feet Per Second):** 2,120

Wind Direction: 0.0 O'clock

Wind Velocity Of: 0.0 Miles Per Hour

Wind Components (Miles Per Hour): Downrange: 0.0 Cross
Range: 0.0
Vertical: 0.0

Altitude: 0 feet with a standard atmospheric model

Temperature: 59° F

RANGE (Yards)	VELOCITY (Ft/Sec)	DROP (Inches)
0	2,950	-1.5
50	2,904	-0.5
100	2,859	-2.04
150	2,814	-4.64
200	2,770	-8.33
250	2,726	-13.15
300	2,683	-19.15
350	2,640	-26.35
400	2,598	-34.79
450	2,556	-44.53
500	2,514.6	-55.59
550	2,473	-68.02
600	2,432	-81.88
650	2,391	-97.21
700	2,351	-114.05
750	2,311	-132.47
800	2,272	-152.51
850	2,233	-174.23
900	2,194	-197.7
950	2,163	-222.97
1000	2,118	-250.1
1050	2081	-279.18

[View a text version of this table](#)

TRAJECTORY FOR CUSTOM .51 M33 BALL, .50 CAL. 647 GRS. AT 2,910 FEET PER SECOND

Elevation Angle: 0 degrees

Ballistic Coefficient: 0.67

Velocity Boundaries

(Feet per Second): 2,120

Wind Direction: 0.0 o'clock

Wind Velocity: 0.0 Miles per hour

Wind Components (Miles per Hour):

DownRange: 0.0 Cross Range: 0.0

Vertical: 0.0

Altitude: 0 feet with a standard atmospheric model

Temperature: 59° F

RANGE (Yards)	VELOCITY (Ft/Sec)	DROP (inches)
0	2,910	-1.5
50	2,839	-0.52
100	2,770	-2.12
150	2,701	-4.85
200	2,634	-8.77
250	2,568	-13.95
300	2,503	-20.44
350	2,438	-28.32
400	2,375	-37.66
450	2,312	-48.54
500	2,251	-61.04
550	2,190	-75.26
600	2,130	-91.29
650	2,071	-109.24
700	2,013	-129.21
750	1,956	-151.32
800	1,901	-175.71
850	1,846	-202.5
900	1,792	-231.84
950	1,739	-263.88
1000	1688	-298.8

[View a text version of this table](#)

The Weatherby rifle retains a fully adjustable stock comb, an adjustable buttplate, and a fore-end rail system for a front sling and Harris bipod. Using the hinged magazine plate, the rifle can be fired from a very low prone position with ease. While the barrel is a lightweight, it is fluted, and that can reduce heat issues. The muzzle of this rifle has a threaded protective end cap, and I would assume this gun could be set up very quickly for a GemTech-style suppressor.

Shooting the Armalite in .338 Lapua had not illustrated any major level of recoil from the bench or prone over a pack. However, the Weatherby rifle was lighter in weight at 14.10 pounds empty, and I fully anticipated some pounding. Surprisingly, the benchrest zero work was uneventful, save for the increase in buttstock slap against my shoulder.

Next Sunday morning on the wide open prairie, sitting atop my 4x4 scanning miles of dog town mounds for life, I locked into a fat dog that ranged 641 yards by way of my Swarovski ranging bino. As the Steiner scope didn't come with any ranging data, I turned to the hashmarks and judged the shot to require a 32-inch holdover. Wind was not a problem at all that early in the day.

The Lapua will drop about 98.9 inches at 600 yards off a level muzzle, according to my tables (included in the "Golf" chapter in this book). With the 200-yard zero, I would, naturally, take some off that drop figure, but, since prairie rats don't shoot back, I was content to drive a slug into the dirt as a first round and see what came up.

Touching off the first round did indeed return a ground splat, for a correction of a full Mil in elevation, but no adjustment for windage. The second round sent returned a hit that was still low, but upended the prairie rat to send him scurrying down his den hole for cover. I had rearranged his lodge a bit, but he was none the worse for wear.

With a bit of wait and see, a second grass rat eventually emerged at a ranged 430 yards. I took a dead-on hold with a pill of daylight over the Mil Dot, and the round was sent. This time the 250-grain MatchKing found its mark.



In big country, range is always a problem, and knowing the ballistics associated with your rifle and cartridge will aid you greatly in being able to hit those far-off targets.

CHAPTER 7

DETAILING YOUR RIFLE FOR DISTANCE WORK



This ultra long-range varmint rifle has a custom barrel for one good reason: It shoots where you point it. That's always the bottom line when it comes to expected performance.

WHAT MAKES A GOOD rifle shoot well? The answer takes some explaining, but, when you sort through all the accessories, all the gadgets, all the things you could do, there are those things that are nice, some that are ridiculous, and just a handful of things a long-range rifle can't live without.

BARRELS: TOP PRIORITY

When discussing the elements of a good shooting rifle, the first consideration, to my way of thinking, is the barrel. I know some will not agree with me on this, but here's my rationale: The action, trigger, even the bedding system, all of that's for naught if that barrel won't shoot.

There was a time when at least one if not more of the big manufacturers kind of lowballed their barrels. It was noticed, at once, by shooters everywhere, and things changed fast. You can't have a poor shooting barrel on any rifle and expect someone to use that gun with any degree of success.

The best barrels are often custom-manufactured pipes. I have been in the H-S Precision factory, in Rapid City, and watched a barrel being drilled and rifled from a piece of raw steel. These barrels are handmade to each specific rifle, and a good deal of attention is given to each step in the manufacturing of every pipe.



Fitting the pieces together at H-S Precision during the manufacture of a complete rifle.

H-S isn't the only one exerting this kind of care and craftsmanship. Barrel manufacturers like Douglas, E.R. Shaw, Shilen, Pac-Nor, or Hart, to name a few, will always produce a barrel of extreme quality and, if one turns out not to be a shooter, it will be covered to the last degree by warranty. H-S Precision, for example, states all its barrel will shoot sub-MOA at 100 yards or the rifle comes back.

As an example of exactly what can be expected of a quality barrel, the chart on this page shows the results of some benchrest shooting done with a variety of ammunition run through an H-S Precision rifle. I selected this example, because I have spent a significant amount of time behind this rifle

and have learned it well as a long-range varmint rifle. While I'm not about to say that everything about these solid groups is the result of a good barrel on the rifle, I will say that, lacking that quality pipe, none of these groups would be even remotely possible.

TESTED: H-S PRECISION BOLT-ACTION IN .22-250 REMINGTON

FACTORY LOAD/ HANDLOAD	BULLET/LOAD	MUZZLE VELOCITY (fps)	GROUP ("") (3-Shot@100Yards)
Factory	Winchester 40-grain JHP	4,000	.542
Factory	Winchester Super X 55-grain Pointed Soft Point	3,680	.486
Factory	Winchester USA Brand 45-grain Jacketed HP	4,000	.620
Handload	Sierra Blitz King 55-grain/38.0 gr Hunter*	3,361	.470
Handload	Hornady V-MAX 55-grain/38.0 Hunter*	3,327**	.381
Handload	Barnes VLC 50-grain/40.7 Hunter*	3,546	.455
Factory	Federal Premium Nosler BT 55-grain	4,150	.532
Factory	Federal Premium Sierra Game King BTHP 55-grain	3,680	.388
Handload	Trophy Bonded Bear Claw 55-grain/ 39.5 Hunter*	3,478	.444

[View a text version of this table](#)

* Ramshot Powders/Western Powders Inc.

** Chronographed



A barrel under construction at H-S Precision, in Rapid City, South Dakota. H-S makes all its own barrels from scratch. That way their gunsmiths know they're going to shoot well.



An H-S rifle in the test tunnel for final group printing. Every rifle gets this treatment prior to leaving the factory.

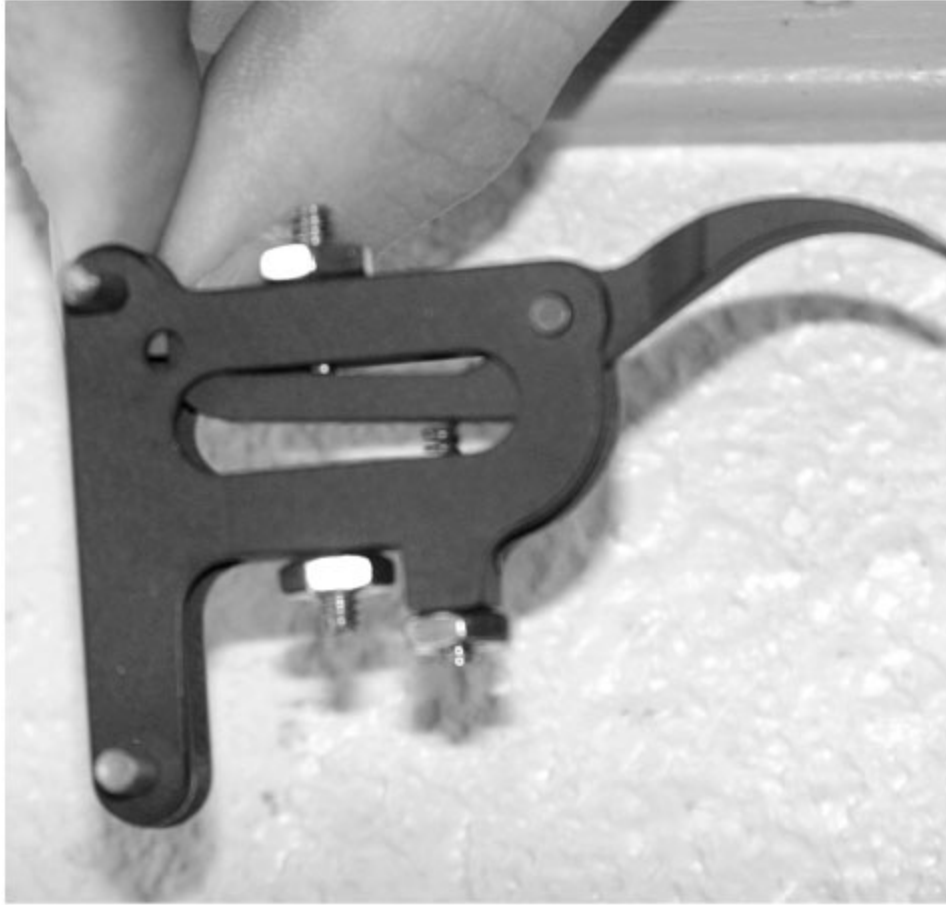
You don't have to go the custom route. There are some very good factory production line rifles out there. Weatherby guarantees sub-MOA on many of its rifles, for instance. Kimber is another company with a stellar reputation for out-of-the-box accuracy. I've had a great experience in particular with a Kimber Pro-Varmint in the .204 Ruger. This rifle has a 22-inch barrel and a custom Model 70 Winchester-style action. Accuracy is paramount with Kimber, yet this is a rifle you can buy right off the dealer's gun rack. Many shooters tend to believe that a rifle such as this Kimber is about as close as you're going to ever get to a handmade custom rifle and still get to buy it off the shelf from a local dealer. Do your research, there's a lot out there to choose from—and if you end up getting a stinker, you can always get it rebarreled!

TRIGGERS: SECOND TO NONE

I want to start by saying that I have shot so many rifles with bad triggers in my life, that I can make almost any trigger workable just by “mapping” the thing as I work with it. Triggers are the link between the cartridge and the barrel and, when sending the mail out of that pipe, the better the trigger, the better the accuracy. In fact, without a good trigger on your rifle, life on the bench is far from fun and accuracy is an uphill battle, no matter how good your barrel is.

I shoot a little Remington Custom 40X .22 rimfire that, with its short Hart barrel and tuned 40X trigger will shoot one-hole groups on paper all day long at 25 yards and a rough hole at 50 yards. When I bought that rifle, it had been a project gun at the Minnesota School of Gunsmithing. The young man who built it had done an outstanding job, and even though the rifle is now almost as old as I am, I wouldn't think of parting with the little dead-on shooter.

When I buy a fancier grade of rifle—which isn't often, given the kind of money a gun writer brings in—I try to get that rifle to my gunsmith for trigger work right away. Now, trigger work even on a factory trigger doesn't have to be expensive. My local gunsmith will dress up a trigger by taking the creep out of it, lightening the pull, and producing a nice even let-off for about \$40. That's a low price for an accuracy gain each and every time I light up that gun. I figure that just by reworking a trigger I can pick up at least ¼-MOA or better. That can take a miss to a hit on a speed goat, mule deer, or old song dog standing far off.



A trigger used on an H-S Precision rifle. These are handmade in the USA. Triggers are a major part of an accurate rifle.

In most cases, a custom rifle, if you're lucky enough to afford one, will already have a good trigger and, if not, the maker has goofed up someplace along the line and that rifle needs to go straight back to wherever it came from. In the out-of-box department, triggers can vary, as some rifle manufacturers pay more attention to the company's legal department than to their shooters' needs. We like to call these triggers "lawyer triggers," because it takes a tow truck and cable to touch them off, or so it would seem at times. Heavy triggers don't go off as easily, and that's the rationale behind a heavy eight-pound pull on a factory trigger, i.e., the whole mess isn't as likely to end up in court when someone shoots their foot off. Just

know you don't have to live with such an awful trigger. Nor should you. When you buy that factory rifle with a rough or heavy trigger, simply see a qualified and quality gunsmith for a trigger job.

Having a custom trigger installed in your over-the-counter rifle is still another option, but, unlike a trigger job, dropping in a new, high-end job doesn't come cheap. A good trigger can cost hundreds, and they are one reason the components that go into a quality custom rifle add up so quickly. Triggers such as those from Jewell, Jard, and Timney are upper crust and are a delight to shoot. They will cut inches in bullet group accuracy off your long-range targets.



The author with a Black Hills coyote taken with a Browning A-Bolt Varmint. These rifles have basic factory triggers and, at times, do need some slight tuning to get all you can from the rifle.

When you get that new rifle home, be it a custom or factory-built gun, the first thing you need to do is to start learning that trigger. Every trigger has its own character, and the only way I know of to get the feel for that trigger is to shoot the rifle and shoot it a lot. In a two-stage system, one with a very short take-up of slack followed by a solid feel, once that solid feel is encountered, it should just drop away and release the firing pin. In a single-stage system, there should be very little movement prior to let off and, when

that trigger breaks, it should be very crisp, almost a complete surprise to the shooter.

When you're on target at, say, 450 yards and those crosshairs are lined up, the last thing you want to have happen is to have the crosshair slide to one side or another as you try and get that firing pin to break free and light off that cartridge. And that's exactly what will happen with a heavy, rough trigger. On any target, but especially at distance, you want to control every element that deals with the shot, and when everything is all lined up and you're holding dead still while not breathing at all, crack that trigger and then hear as well as see success ahead of the muzzle. For instance, working with my .243 Winchester in a Remington VS heavy varmint rifle, my choice for long-range prairie dog shooting, I always feel in complete control when on a dog town and punching away at rats as far away as 600 yards! That's because I know my rifle like a good old book, but also because, most of all, I know that the trigger will break free at exactly the same place each and every time I want to send a round.

I would be dead wrong if I didn't take into account the massive improvements in some factory triggers today. In one particular case, that improvement is related to a rifle that won't cost you an arm and leg to own. Several years ago, Savage developed its Accu-Trigger system. This special design makes use of an inner trigger shoe that must first be engaged prior to the actual trigger going into engagement. This is a safe and dependable system. I have tested this trigger on the Model 112 Heavy Varmint and also on my own personal Savage Model 16 .223 Rem rifle. When I first took this trigger to the rifle range, I was completely taken back by the ease at which I was able to pick up the use of its design. Even better than its user-friendly configuration, though, is the fact that you can adjust the AccuTrigger to any weight you like, because that first stage trigger shoe remains a constant

prior to engaging that second stage. Half a pound is workable, and that means the final stage could just about be set off by a butterfly's wing. With the advancement of the Savage trigger, other manufacturers have started to clean up factory triggers. Remington, for instance, used to have a heavy but workable trigger, but has now moved to a totally new trigger on its outstanding Model 700 actions.

Another option in a rifle trigger is a "set" trigger. If you're not well-versed on set triggers, they work this way: When you're ready to shoot, you push the trigger forward, thereby adjusting the trigger from its normal drop weight of about three or four pounds to something less than a pound of let-off. Now, when you're ready to squeeze the round off, simply a light brush across the shoe will dislodge the firing pin. In effect, trigger control has been minimized greatly by the function of the set trigger.

The old Sako 75 is a lighter-weight varmint rifle with a set trigger, and it was also available as a benchrest-weight stainless steel laminated model. Its upgraded, more modern version, the Model 85, has the set trigger as an option. At the time of the Model 75, the set trigger was a new deal for Sako, and it took a great deal of time to get those legal eagles to go along with making that change to its varmint rigs. Set triggers are great in the field, but they can be touchy and are definitely not for the beginning shooter, as that skimpy nine ounces of pressure is just too light for the inexperienced and unpracticed rifleman.



The author with his Remington VS in .243 Win. This rifle has a factory trigger that is outstanding right out of the box, sub- $\frac{1}{2}$ -MOA with good ammunition.

Field testing the Sako 75 in the Varmint Stainless Steel (SS) configuration proved enjoyable from the benchrest position. Chambering

the .308 Winchester, the rifle was able to place bullets on prairie dogs with ease well out to 450 yards. I'm sure much longer shots were possible, the gun simply shot that well, and part of that success was undoubtedly due to the set trigger.

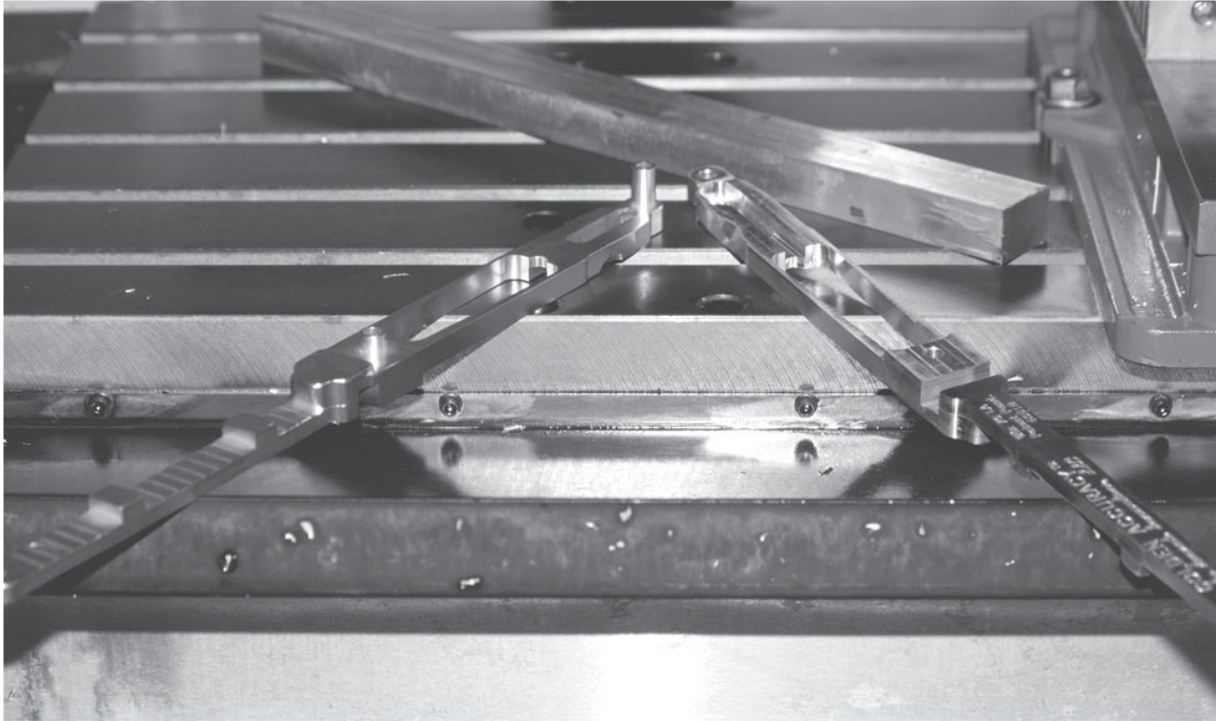
ACTION PLATFORMS

My first involvement with rifle actions and the stocks fitted to them occurred more than 45 years ago. At that time, I was building up WWII surplus Springfields and Mausers for use on the local deer hunting population of north-central Minnesota. Those 8mm German Mausers and 03-A3 Springfields allowed me to learn a great deal about just what bedding will do for a rifle's accuracy.

Lacking any sophisticated bedding back in those old-school gun-building days, you could be sure that most of those rifles would not be capable of holding anything close to a minute of angle at 100 yards. But, by using a thick layer of fiberglass bedding material and driving the barreled action down into the wet surface during application, then allowing it to set until the bedding material was hard and dry, I was able to achieve some of the results that are so common with many of the better rifles in commercial production today. I guess more by luck than brains, I was often able to get one of those old Springfield .30-06s to drive 110-grain coyote bullets inside ½-MOA, even in those old two-groove late-production military rifles. More than one song dog, fox, and crow met their maker to the whack of the old '06, and some of those actions and my bedding jobs were good enough to deserve beavertail fore-ends, straight target stocks, and better grade glass, during their heyday in the 1960s and 70s. All in all, seldom did I ever observe a rifle that shot well and lacked a solid bedding beneath the action.

Of course, that was some time ago, but it did go to show how much bedding can affect the accuracy of a rifle. Things have improved since then. I guess the first real class-act bedding system I owned came about through the Remington Varmint Synthetic .22-250 and .243 Winchester I've discussed previously. H-S Precision stocks, wisely bought by Remington, and CZ factory rifles, retain what's known as pillar bedding, which disallows the action to shift or change zero. Group sizes with both of these rifles have always been under ½-MOA at 100 yards, and neither gun has ever suffered a change in zero over the years.

A good deal of attention over the last decade has turned to synthetic stocks. They are efficient and often cost-effective to produce and are rather impervious to the elements. Especially because of this last, these stocks can lend themselves greatly to accuracy. Some hunters, on the other hand, are turning toward other innovations, such as different types of wood stocks employing full-length aluminum bedding systems. Why are the designs that use pillar bedding with aluminum inserts around the action lugs or a full bridging system so effective? When the rifle fires, the barrel vibrates in a way or wave that we call "harmonics," and the action, along the length of its side rails, will flex as though it were made of rubber. The flexing is very slight, in the realm of tens of thousandths of an inch, but it is enough to change the alignment of the action to the barrel in other bedding types, and, so, the next shot will cause the barrel and action to vibrate differently. This difference in bedding alignment will change bullet impact from a good deal to a small amount. That ain't good. These more advanced bedding designs are much more effective at preventing that problem.



These are bedding blocks machined from solid aircraft grade aluminum bar stock. Note the blank bar at the top of the photo. That's where the Accurate Innovations system gets its start.

CUSTOM TRIGGERS FROM TIMNEY

It was after writing the first edition of this book that I came to the realization that there was a whole new world in the area of the custom trigger. I guess the first issue came up when a Remington factory trigger on a new Ruger rifle chambered in .204 Ruger went south on me, as did a second trigger on a Savage varmint rifle. That Savage rifle cost me a fine red stag in Australia, and also a very heavy boar. Those misses and the problems with the Remington trigger got me thinking hard about possibly turning to something more advanced.

It was a Timney custom aftermarket replacement trigger, in prototype and made for a Savage, that first caught my eye. No, it wouldn't work on that Savage varmint rifle, because really, no one

has a replacement for the AccuTrigger, which is generally very good (I ended up replacing it with a new AccuTrigger), but I couldn't get that custom prototype out of my head. Soon it had a home on my Savage 110 LE .308.



A Timney ready for transport to the dealer.



Check your triggers for exact pull weight, before investing potentially wasted time on the range or reloading bench. When your trigger's too heavy, it won't matter at all how good your rifle or loads are.

The new trigger made an already great-shooting rifle pick up an additional $\frac{1}{2}$ -MOA of accuracy at once and allowed me to develop some additional confidence in my that rifle. For the most part, the Savage 110 LE is as good a long-range rifle as any out there today and one pile of bucks less money than most. Now, with the Timney installed, I was anxious to see what it would do downrange.

Some time later, I was offered the chance to visit the Timney factory, in Phoenix, Arizona. This turned out to be a real boon to my education regarding just what it is that goes into a fine-tuned custom trigger. As a trigger builder, Timney's been around for a very long time, but business is booming like never before. The company

recently built and moved into a state-of-the-art facility that makes use of a full CNC production line. After preliminary machining, the parts are turned over to a group of employees in a clean room, for individual hand held assembly. Each member of this unit has a very specific task to perform on a trigger, and after the trigger has been assembled, it goes to a final stage that involves the trigger being fully installed into the rifle model for which it was built, completely hand-tested for function and pull weight, then passed on to be packed and sold.

Currently, I have five Timney triggers on the same number of my working field rifles. About the only thing that didn't go like I had envisioned was my request for an AK-47 or Russian Draganov sniper rifle conversion. Timney's president and CEO told me right off that they had tried this move, especially because the original triggers on these two rifles are very poor, but the specs on those rifles tended to vary so much that no single new trigger could be built as a one-unit-fits-all design. Those aren't the only two: Even the Savage 10 LE trigger system must be installed using some of the basic Savage trigger parts, because no two rifles in this model lineup tend to be similar enough to allow for a single dedicated design.

Regardless, whether you have a gun that takes a Timney without a hiccup or you have to incur the slight inconvenience of having the rifle sent in to Timney for a better part, do it. As evidenced by my own Savage 10 LE, accuracy can be significantly improved with a better trigger. And, when long-distance is the goal, every edge you can find should be taken advantage of.



Mid-range rifles in long-range roles. This AK is chambered in the 6.5mm Grendel, a great example of a small round doing big things down range. Of course, that kind of thing is only possible with a good trigger, which the AK is not known for. If this is your choice of rifle, sending it off to Timney to work on can do wonders for the gun.

Any one of those three bedding types in a rifles action are good. I have my preferences, obviously, but that doesn't mean the others are bad. The trend has certainly been that of moving away from fiberglass and towards aluminum. I believe this is good; aluminum is truly the way to go if you want top-end accuracy. This bedding material can be laser-cut to the final millimeter in size and installed in a synthetic or wood stock. If the full-length bedding has any drawback at all, it is that it will increase rifle weight slightly. To be sure, when a mountain rifle like a Remington Model Seven gets a facelift with this kind of bedding, its weight increase really isn't even noticed—but its newfound outstanding accuracy will be. In fact, I have found that these aluminum bedding designs will consistently pull in the group accuracy of a Remington 700 a full quarter-inch almost all the time. (Remington actions, with their round undersides, like the long and high contact point system very much.)

There is one more type of bedding, and it's really no bedding at all. Called "chassis" guns, these super guns were covered in a [previous chapter](#). These rifles don't make use of bedding at all, but are rather a sophisticated way of marrying actions and receivers metal to metal.

THE SISK TACTICAL ADAPTIVE RIFLE

If anyone wants to see the future in rifle building art, one only has to take a hard look at what one rifle builder in Dayton, Texas, is coming up with as a totally flexible firing platform. Charlie Sisk, namesake of Sisk Rifles, is offering a rifle that has a raft of patents

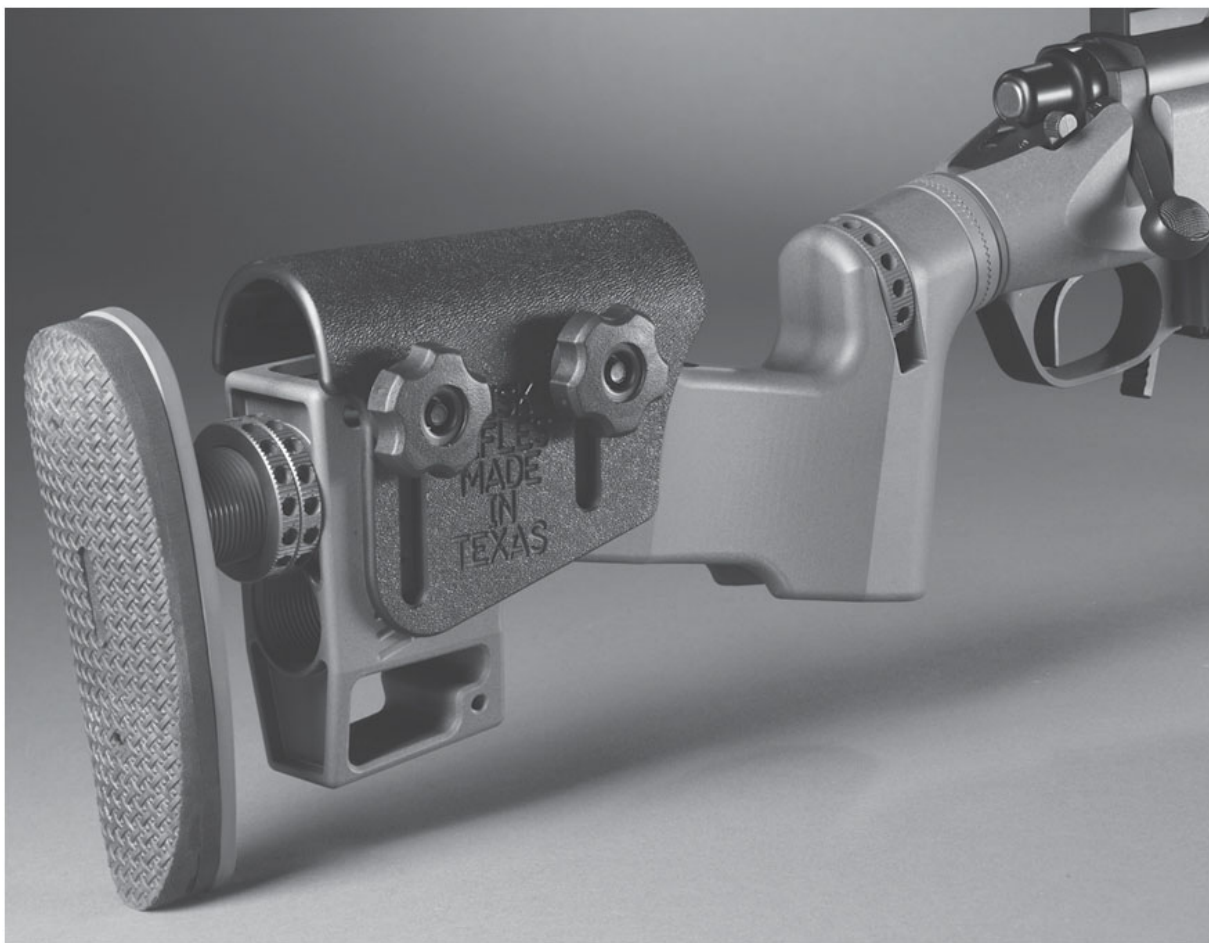
about as long as your arm. The fact is, Sisk has so many elements integrated into his rifle designs, many of them won't be released until several years from now. Why? Because Sisk Rifles is developing a totally new concept in stock design that takes the rifle as an individual operational tool to a completely new level.

Spending some time with Charlie at his operation, which includes a housed 100-yard high-power rifle range and standing gun towers for sniper training, among other features, I was able to quickly see that this designer is not your average guy in the gunsmithing business, but, rather, an innovator of the first order. You see, Charlie's STAR rifles are able to self-adjust for accurate hits from the point of the shooter zeroing their rifle at any given range. He can't (and shouldn't, at this point) disclose how all of this works, but some things I can tell you about are that the buttstock fully rotates and the pistol grip stock rolls to fit the exact needs and feel required by the shooter. The entire action and barrel are set in an aircraft aluminum platform that won't bend, vibrate, or flex in any way. Shooting the Sisk STAR rifle in a very controlled environment produced groups that measured .30-caliber—that's one .30-caliber hole representing a full group of shots at 100 yards.

Now, I don't sit around burning up rifle barrels trying to cut one-hole groups much of the time. Sure, it's nice to see a rifle shoot that well, but the fact remains that most game and other targets outside of serious target competition don't require this accuracy. Still, that Charlie has devised something this accurate, and in some fairly revolutionary ways, could be a portent for the accuracy of other rifles to come.

After zeroing and 100-yard group shooting with these new rifles, the guns were taken to the open air towers and set up to be shot from angled rooftops, flooring sections, and table mounts. Pop-up steel torso/head silhouettes were set in place to be addressed from these towers at distances ranging from 50 to 213 yards. Shooting handloads that consisted of Sierra Match and Berger VLD 168-grain .308 pills, targets were fired on, as Charlie called off the range and cleared the shot. Shooting through Leupold M4 glass, top of the line and a favorite of mine, the task at hand using 14x magnification proved to be simple. I produced one missed steel target out of 20 at 213 yards; winds were three percent and cutting across a treeline at 20-plus miles per hour. The missed target was almost grazed on the right side, thanks to a slight crosswind that could have been a sharp down or cross draft at the target end of the deal—on the other hand, I could have flat-out missed, but it didn't feel that way when I sent the bullet.

Am I saying that the Sisk system is foolproof? No, but, if it's not, it's very close. Adjust the rifle to your exact fit, chamber quality ammunition through a custom action, use high-grade optics, and, yes, this rifle can be a one-hole shooter to 100 yards, as well as a very accurate, fast-handling sniper tool from an over-watch position. Either way, there's no other way I can see this rifle and its creator than anything other than the future of long-range accuracy.



The buttstock on Charlie Sisk's STAR rifle fully rotates, among other things.



CHAPTER 8

OPTICS THAT GO FAR



T-3 Tikka with a Kahles 3-9x with sniper hash marks is a nice rifle in the .223 Rem. Mike Nischalke is doing the shooting.

LACKING A GOOD-QUALITY SCOPE on your rifle and a binocular hanging around your neck, much can be lost out beyond a human's normal visual abilities. It's kind of like bird hunting without a good bird dog. Sure, you're bound to kick up something eventually, but oh how much more you'd get with a good nose and four legs working the cover.

I knew of a hunter who just would *not* drop a dime on anything but a low-grade scope and he'd spend even less on his binocular. Little did he

know the number of targets he passed up, simply because he could not see them. His rationale was simply that this was pure entertainment to him and, so, he didn't care to invest much, if any, real money in the sport.

Consequently, I never observed him take a shot much beyond 300 yards, never saw him get excited at a chance to put a bullet in the hide of a coyote slinking across the skyline at 500 yards, let alone get pumped at the sight of a feeding mule deer or pronghorn that required a careful stalk before attempting a longer shot. That's fine, to each their own, but the real capper was that this guy, hampered as he was with his poor quality optics, had terrible natural eyesight. With his poor vision, this hunter, if anyone, should have been *keenly* interested in better optics. Alas, that was not the case and, to my way of thinking, his hunting always suffered. In effect, he was hunting and shooting almost blind most of the time.



Weaver has moved forward and well into advanced field optics for long-range shooting and hunting. From binos to ranging devices sold at a fair prices, these tools have real value and are effective.



The turret arrangement on the BSA Sweet 17. It's easy to read and use in the field.

There's an old saying among big, open country game and varmint hunters: If you have to cut back somewhere in your equipment, put less in a fancy stock, embellished metal parts, and even an expensive shooting caliber and turn, instead, toward a good scope and quality binocular.

Prior to getting into the choices in these tools of the long-range shooter, there are a couple facts I'd like to share with you. First, in terms of many of the off-brand scopes sold today, be advised that many of them come off the

same assembly line as those brands you're more familiar with. They simply get stamped or capped off with a brand that is different from another at the other end of the line. Yes, that's correct, the same run of scopes, but with different names. That can make things confusing. The brands that are truer, the ones that don't run multiple brands off the same manufacturing lines, are the ones you'd expect to be, well, pure, the American and German glass many of us have come to associate with high quality. If you buy Leupold, Weaver, Redfield, Nikon, Burris, Bushnell, Simmons, Millett, or Sightron, to name a few, you're in good hands all the way. Still higher on the scale are those upper-end Zeiss and Swarovski/Kahles glass sighting and spotting optics that, without question, are at the top of the food chain.

How good is the high end? Shooting for a year through a Kahles 3-9x with sniper hashmarks, which sits on my Beretta Tikka T-3, totally spoiled me. If I were a one-rifle shooter and had to make a choice in optics, either that Kahles or my current Leupold glass would be first choice. Still, you don't have to go that far. In terms of value for the dollar, Weaver is the scope to buy all the time. Leupold, which has glass in a wide variety of price ranges, is all-American and very well made, and the company stands behind each and every glass tube sold. Bushnell may not be fancy, but I have run a Bushnell Yardage Pro 400 laser rangefinder almost forever, or at least from the very first run ever produced, and it hasn't failed me over these many years of hard, dedicated use. I also have several of Bushnell's 3-9x and fixed-power 4x scopes mounted on hard-pounding Hastings Paradox slug shotgun barrels that have been absolutely *rocked* by 500-grain 12-gauge projectiles for many a year back to back, and not one of them has given up the fight. Of late, Bushnell has upgraded its scope line to include a new Tactical series, configurations made popular by a country on a war

foot. Also, its long-range varmint glass released just this past year (2013) is a *massive* step above previous like models in this brand.

Over more than 30 years on the bench and in the field, I have used just about all the name brands, and, when it comes to my personal rifles, most of them mount Leupold glass. I have a Leupold 3-9x Gold Ring and old Weaver mounts locked onto a Winchester Model 70 .30-06 that was bought as an already assembled package back in 1964. The rifle has been hunted with across Wyoming, South Dakota, Minnesota, and half the southwestern end of the country and *never* has there been a need to reset the zero on it. That's performance way beyond any expectation. Don't get me wrong, I'm not saying that you need to mortgage the house to get better optics for field use, but do try to move beyond the ultra low-end products. If you're shooting and hunting hard, they're just not going to get it done for you. Too, buying something over and over again because it keeps failing will likely end up costing you at least as much as if you'd bought the good stuff just once, but buy the good stuff once and you'll be minus the frustration that comes with equipment that fails you when you need it most.

GLASS BUYING TIPS

If you're buying glass, don't just sight the scope or spotting system across a store's interior. Step outside the store (get the sales guy to accompany you, of course), and get a real-world view of things. Often the natural light, and especially low light in the late afternoon, will show a completely different set of capabilities to a binocular, spotting scope, or rifle scope.



Here, spotting glass and scopes make the day on a long-range prairie dog town. Without quality optics, you're shooting blind.

One very important element to consider when buying a rifle scope is the reticle. They come in a dizzying array, but, since the focus of this book is shooting at long range, what you want is a reticle that can aid you in fast

ranging estimation. Reticles that serve this purpose can be bewildering, their numerous dots and lines seeming to make the optic cluttered. However, because you will need information that tells you as close as possible the exact distance of an animal, so you can select the correct wind drift and holdover for the bullet, using a varmint hunter's reticle or Mil Dot arrangement is required here. While simpler (and, therefore, something you may be drawn to), big, wide-open crosshair reticles are designed for running shots or low-light deer hunting and they won't help you one single bit when trying to figure the bullet drop and drift on that 550-yard mountain marmot.

The varmint or Mil Dot reticle is set to distances, calibrated against common bullets for 200, 300, 400 yards, and more. They are also pre-set for wind deflection using a 10 mph wind as a baseline indicator. Line up the Mil Dot or hash mark, set right or left for wind, and send the bullet downrange. Once you learn how to use them against your ballistic charts for range, these intricate reticles are not much harder to use than your DVD player.

Scopes are advancing at an unprecedented rate. Even with the technology available in dedicated ranging equipment, we now have rifle scopes that carry their own ranging systems, right along with quality, long-range optics. But, assuming you don't have such a combination unit and are working with other scopes that are appropriate to long-range rifle work, what are some of the other features you should be looking for?

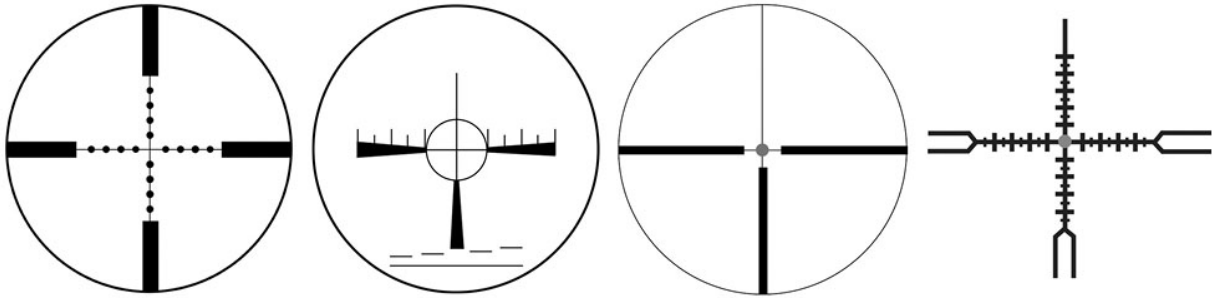
First, pay attention to the turrets. Some shooters want exposed and high turret knobs. They certainly have their benefits, particularly in that they allow for quick changes in the field. However, if you're of a mind to just hold to a locked-in range, say a 200-yard zero, and work with Mil Dots or hash marks in the scope reticle, the use of these highly exposed turrets (and

incurring their added expense), really isn't required. Indeed, in uses outside those of the controlled environment of the benchrest range, these setups tend to get moved off the correct zero by indelicate handling. If you do chose to go this route, do what those practiced benchrest shooters do and keep a pre-marked shooting card with you that allows you to know right away if anything has changed on the turret itself.

The second facet to consider, and certainly the more important, is what magnification you should choose. I like to look to the guys who make their living taking shots at long range for that answer.

For the most part, military long-range snipers tend to favor a scope that will not advance above 12x. That's because target mirage can cause the physical target to "jump," i.e., it's not where you think it is when you pull the trigger. By working with lower power glass, the mirage is lessened and the target better stabilized in the view.

I know you're thinking that 12x seems pretty minimal, and there are cases for using more. Prairie dog shooters and long-range big-game hunters, for instance, often opt for high magnification scopes, because target identification is paramount to them—a burrowing owl mistaken for a prairie dog will get you a federal fine and possibly jail time, and you really don't want to have to explain to the guy with the game warden badge why you shot that cow elk who had her head in the trees and which you were sure had antlers, when you're only carrying a bull tag.



These are four different reticles used in long-range scopes. The Mil Dot illustrated will allow the shooter to raise the aiming point without adjusting turret knobs. Each system has its own advantages in the field.



The author on the 1,000-yard range, test-firing a .338 Lapua in the new TrackingPoint target acquisition system.



The author's business partner, Jerome Besler, shooting the TrackingPoint .338 Lapua. Two rounds went dead center at 100 yards, and that included first-round cold-barrel accuracy.

I will often move up on a large dog town that can spread over a mile or more and glass that town for active animals. Here, I'll run a varmint scope up to 14x or 16x during scanning, then drop down the power to pick up a full field of view that covers an entire 400-yard-wide ridge at, say, 500 yards. For this kind of long-range work, the high magnification glass gives me more flexibility, though less power, in the field.



Trijicon's ultra long-range computer sight, with a .50 BMG.



Trijicon's ACOG—Advanced Combat Optical Gunsight — can acquire a target 600 or more yards downrange *after dark*. This fixed-power optic, available in several different power levels, isn't really intended for long-range work, rather for CQB—close-quarters battle. Its strength is in its bullet drop compensator and “an illuminated reticle pattern for use in bright to low/no light.”

What magnification do I use the most? I play a little game with myself, in which I find my target and pull back the magnification as the target comes into view. When I feel comfortable with my choice in magnification, I drop the trigger. After the shot, I will look at my magnification selector ring. Many times, if not always, it will be between 10x and 12x—which goes right back to what those professional sandbox snipers use.

Overall, products and tools designed for the long-range shooter have advanced markedly since I wrote the first edition on this subject. Where once it was a rarity, it's now common for dozens of high-end scopes from most any of the big-name brands to have computerized systems in them that

work to record, compute, and adjust for direct fire, some even all the way to a mile, when they're matched to an appropriate gun. I call these setups "super guns," and it's because, after a number of years in development, these gun sighting systems have turned the everyday centerfire rifle into something straight out of *Star Wars*. Yet, in spite of all the new, fun tools available for riflemen, there are times when keeping it simple is actually the best way to take on long-distance shooting. My advice is not to be too quick on the trigger, when it comes to buying up all the tools and toys that are designed for finding range and hitting targets. For the most part, the best tool you own is in your own mind.

All that common sense aside, there are some really genius optics out there now. Let's take a look at a few.

The first example reviewed is, in my opinion, simply mind blowing. Dubbed TrackingPoint, it isn't just an optic, rather it's an integrated sight and rifle combination that was unveiled at the firearms industry's SHOT Show, in 2013. At that time, my partner at Ballistics Research & Development, Jerome Besler, and I got to sit down and shoot MOA groups to 1,000 yards with all the ease of shooting Red Ryder BB gun at tin cans set a mere 10 feet away.

Trackingpoint is a precision guided sighting system and, with its paired firearm, is able to acquire and maintain target lock to 1,000 yards or more, and compute the exact range, elevation, drop, and several other related requirements, including the earth's rotation, so as to gain the one-shot dead-center hit each and every time. The system uses what is called PGF technology. This consists of a paired rifle, ammunition, and computerized scope that, after acquiring a target, will allow the shooter to watch the scope adjust each element of the shot (numbering 18 such areas), and, when ready, send a bullet automatically dead on each time.

Shooting Trackingpoint by way of the .338 Lapua, Jerome and I, given two rounds each, both shot from a static position and delivered dead-center hits, both times, at a range of more than 1,000 yards. The weather was dreadful, with full-value crosswinds gusting more than 30 miles an hour, and blowing sand covered the downrange image much of the time. Nevertheless, this high-performance combination came through.

At a cool \$20,000 a crack—yup, you read that correctly, *twenty-thousand dollars*—I doubt there will be much coverage in terms of testing and field time with this new rig down the road, but you never know. Really, at that price point, it is probably best destined to be a learning curve element for most long-range riflemen. The thing is that it's hard to ignore the implications of where these kinds of advancements can take other optic and rifle setups. I am sure we will see more of this technology and, in time, lower costs and smaller systems that are more applicable to riflemen who are not specialists.

You could say modern battle tank technology has come sliding into the middle of optic design and development. When the people behind the M-1 A-1 development started designing sighting system that were 97-percent accurate to a mile while the tank was running at speed, it was only a matter of time until this kind of technology started to show up in shoulder-mounted small arms systems.

Take, for instance, the new Trijicon ultra long-range sight system, the CSAS—Continually Computed Aiming Solution. This sight was announced during the 2013 SHOT Show, and, when I got to put my hands on it, what I saw was a large metal box attached to a Browning .50-caliber M-2. Like the TrackingPoint system, it was programed to shoot 2,000 yards by internally converting all the required elements associated with making a first-round hit at that range. But Trijicon's design has an added element that can

recognize when the target decides to walk, drive, or run away. Its computer takes that data and automatically sets the correct lead for a killing shot. Cost in this case is about \$40,000 and change, or so I was told at the time. That may sound like a pile of money to you and me, but, rest assured, one gunner on this system with a big, bad-ass .50 BMG can own a valley straight away, versus needing to have a full platoon of riflemen running a line of foxholes to accomplish the same task. Yes, as it likely is with the TrackingPoint rig, the CSAS isn't intended for civilian use—in fact, Trijicon's website says it sells this unit only in “direct sales to governments and municipalities”—but, again, I think this heralds the direction “average” optics will be going.

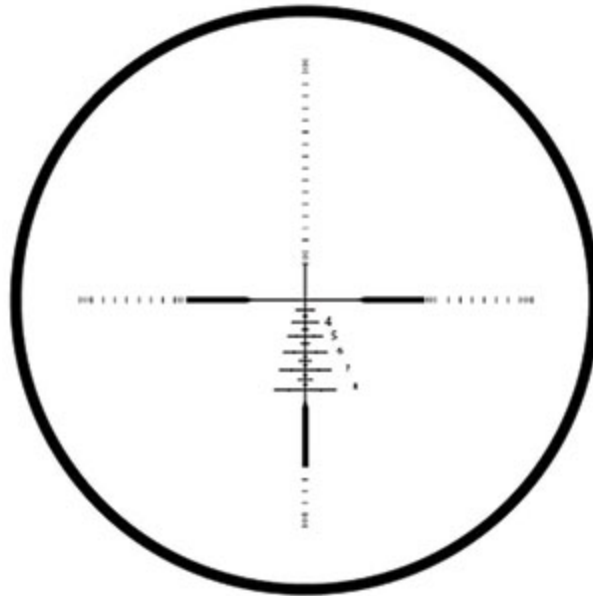


Trijicon's specialty long-range TARS—Tactical Advanced Rifle Scope.

Trijicon hasn't devoted its attention only to these very new, computer-aided sighting systems for combat. This past year, I got the chance to field its new AccuPoint optic against 1,000-yard targets placed among the high desert land of Castle Rock Ranch, in southern Utah. Two of Trijicon's

AccuPoint Mil Spec long-range scopes in a 2.5-10x56mm configuration were mounted on a pair of rifles in 7.62 NATO (.308 Win.) that I shot for testing. The Mil Dots were calibrated for my Federal match grade 168-grain rounds. The super high-grade, sniper-class Steyr sniper rifle was applied to 1,000-yard targets, while the bit more basic close to the same style of the military M-24 in a Remington VS made up the second long-range rifle.

Another completely new optics development is the bright red dot that's now available in Tru-Glo's scopes, including its TruBrite Tactical IR Rifle Scope, which can be had with a bullet drop compensating feature that works to 600 yards. With one on the way for evaluation this coming year, I can't wait to run it out in low light against river bank rats, skunks, and raccoons. The scope comes in as a lightweight and will fit with ease on AR-style platforms and turn-bolts alike. During the past year, I have installed TruGlo sights on cross bows, suppressed 12-gauge turkey guns, and an a AR-15 set up for close-in called coyotes. Price points are very workable (just over \$200), and the sights are as tough as hell. Can't wait to see the scope in action.



Zeiss' Rapid Z reticle, as viewed through a 4.5-14x44mm AO Conquest scope.

There would seem to be a movement underway for the larger optics and gun companies to get into a more affordable realm. My friends at Zeiss have come forward with a new line of very affordable binos and scopes that will fall right under \$400, yet, when you view a target through them, you will still see Zeiss quality, construction, and very high-grade glass. I predict that this run of Zeiss products at this kind of price point will have a major impact on the market across *all* brands in the coming years.



A deadly accurate ranging optic, courtesy of Zeiss.

BURRIS' ELIMINATOR: THE LOWDOWN ON A NEW HIGH-END COMPUTER-DRIVEN SCOPE.

Encampment, Wyoming. It's the late spring of 2010, and I'm at a writer event at the Silver Spur Ranch that's introducing us all to a wealth of new products being offered up to varmint shooting, long-range, and even law enforcement pursuits. Now, being a student of long-range shooting and well-practiced in the use of various guns, loads, and optics that favor the varmint hunter, I'm always searching for a better piece of equipment for those 500-, 600-, and 1,000-yard or better shots, the Eliminator laser scope quickly caught my eye.

This Burris glass has to be regarded as one of the best ideas to come along of late. The company has been involved in laser-ranging scope designs for a number of years, and now it's turned the corner with this finalized version of an ultra effective, computer-driven, laser sighting system.

The Eliminator with a 4-12x magnification (as tested at the time), retains a ranging laser as well as a built-in, computerized bullet drop compensation. It is one tough system to get ahead of, at least in terms of price point and value, compared to anything similar offered by any other manufacture. I've checked out computer add-on units for scopes that, by themselves, cost upwards of several thousand dollars.

The big advantage with the Eliminator is that all of its features are in one package, thus eliminating those very expensive, pack-style field glass ranging units that require first ranging with those units, *then* setting up a rifle for the shot. More than one guide, police officer, and soldier has relayed their story to me about a shooter with a target in range, only to be found with his head stuck to his ranging glass, rather than being down on his rifle. Such a setup creates missed opportunities.

The Eliminator, of course, is not such a system at all. It is, in effect, the advanced design of the early ranging units that came out some years ago in the Laser Scope I wrote about in the first edition of this book, that original unit missing the drop indicator feature installed in this new glass today.



The newest and most compact third-generation Eliminator III by Burris Optics. Now the glass better accommodates the AR platform.



Burris' computer-driven ranging scope in one of its newest iterations, the Eliminator II.

How advanced is the Eliminator? Consider that the first research into developing ranging capabilities within a scope tube took the combined funds of several scope manufactures to get the job done. This was no easy task, especially due to the fact that everything had to be reverse engineered so as to fit it all into a scope tube, then designed to be tough enough to be taken afield. This all meant time on task by engineering, and the development funds required to get this scope to market were massive. Now it's here and, given how much more than just a tube and a couple pieces of glass this

sighting system entails, is actually affordable; retail prices start around \$1,100. With all this taken into consideration, if other makers pursue this path, this kind of optic may, in time, make conventional sighting setups with Mil Dots and crosshairs flat-out antiques.



Rockchucks at 600 yards, via a .223 Rem. topped with a Burris Eliminator. Computer optics turn the trick for this shooter, producing one-shot, stone-dead results.

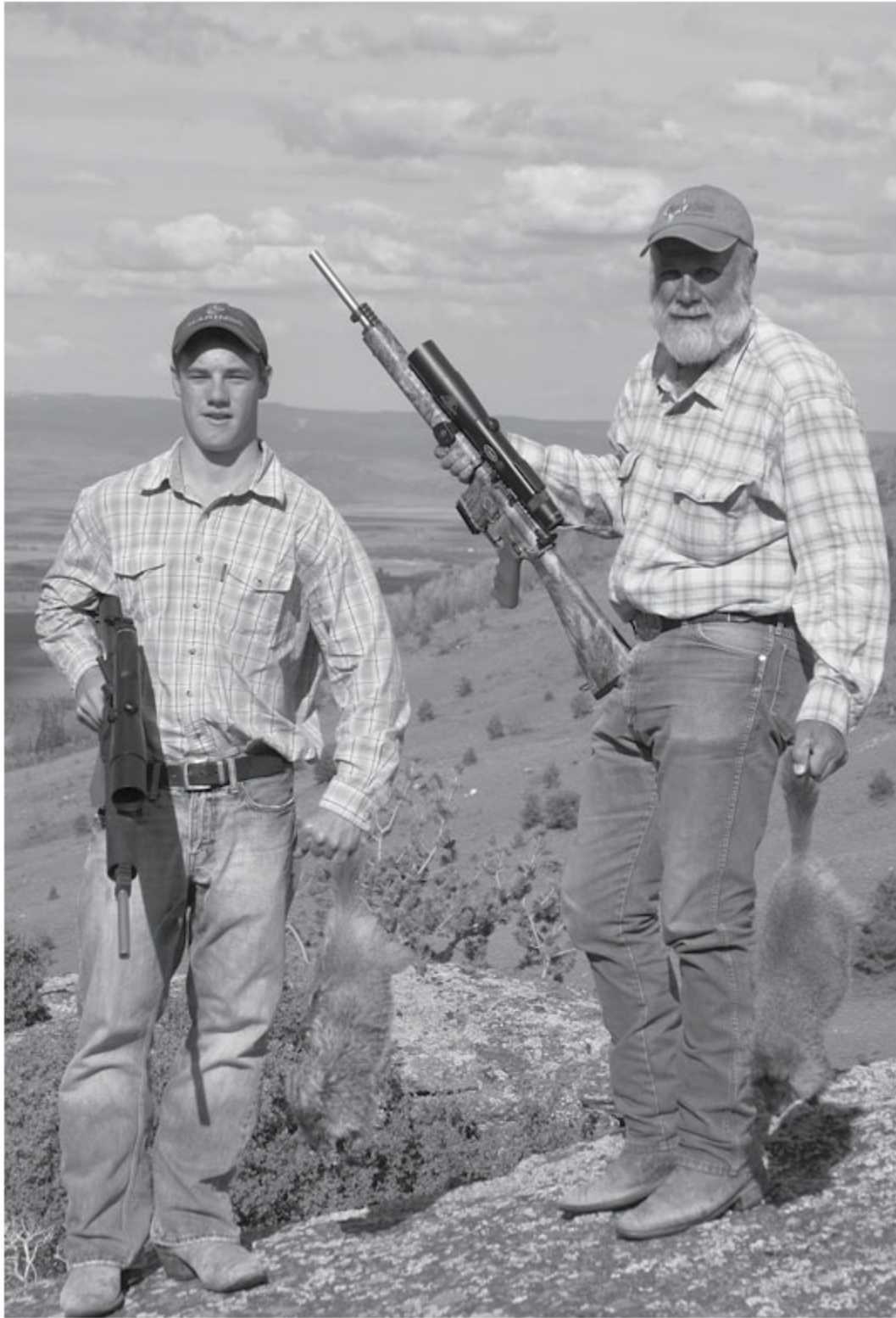
For any shooter using the new Burris Eliminator, a key factor in its creation was in keeping the whole system user-friendly. Face it, not everyone's a hands-on science-type of shooter. I found this out when interviewing current and former snipers who told me the math department was *not* the first stop when they have to enter a classroom setting. Quite often, the need to simply follow a hands-on, easy to understand guide is paramount to them, as well as in the

development of a field glass laser ranging system like the Eliminator. Here's how it all works.

After selecting the cartridge type you intend to work with, the ballistics data for that cartridge is recorded into the scope by way of a number you select from a very long list of cartridge and bullet weights complementary to the scope. Seriously, it takes a click to install your ballistics data. With controls mounted at or near the turret of the scope, everything is easy to locate and use. After programing your load into the scope, (in my case, the .223 Rem. with a 75-grain Hornady JHP bullet), the rest of the deal takes care of itself. That's what the computer that rides inside the scope's metal tube is built for. There's no math required, detailed chart reading, or additional confirmations needed from a second computer or unit tied into the scope. This means no exhaustive schooling time for you or hours on the range getting a "feel" for it. All that goes away.

When programed for a specific load—the list that accompanies the scope comes with hundreds, including choices for the massive .50 BMG—all that remains is the simplest task of selecting a target. That done, set the crosshair dead on the target and press the activation button on the scope body. Now the scope comes to life. At the top of the scope, a window appears that will digitally display the exact range. On the lower, vertical section of the crosshair, a very faint band or grid strip will also display. Now, with a second depression of the same activation button, the exact range in yards or meters (your choice) will appear in the upper window, while, on the strip, at the six o'clock position, a very small bright dot will also emerge at some point on the vertical grid line. That dot on the grid is the point of hold required. Now all you have to do is to set the bright dot on the

intended target and take the shot. If it all sounds easy, that's because it is so.



Simple controls produce results. These critters were taken at 600 yards easily, thanks to what turns out to be a really user-friendly product in the Burris Eliminator.

The Silver Spur Ranch consists of a large land mass that includes both river bottoms and high mountain boulder fields that are jam packed with mountain marmots (rockchucks) gray gophers, and prairie dogs. Also in the mix are badger, jack rabbits, and coyotes, from time to time. The point here is that there are ample targets on which to test a gunning system. I was thinking, at the time that, if the new ranging drop compensating scope could produce one-shot first-shot kills on 600-yard rats, nothing in the man-size target realm (think soldiering application), would ever have any kind of chance against the Eliminator.

Working with professional ranch guides, my first exposure to the new sighting setup came by way of another member of the shooting and evaluation team, one who was assigned to shoot two of S&W's M&P-15 custom-house .223 Rem. rifles. The rifles wore heavy, stainless steel, 1:7 twist pipes, blueprinted receivers, and full military-style stocks. As flattops, one rifle used the Burris low-style mounts, while the other used elevated blocks on a Weaver rail assembly. Shooting a few warm-up targets immediately indicated that both rifles were clearly quite capable of drilling sub-MOA groups all day long at 100 yards. The rifles had been zeroed for the 100 yards—there's also a 200-yard choice—before we writers touched them, because the assumption was that most of the test shooting would take place at ranges less than 300 yards. I couldn't argue with that. This was actually my fifth hunt on the Spur, and a 300-yard performance level coincided with what I'd experienced there before.

This hunt would change all that. While the rifle in my charge was a new Venture Thompson/Center bolt-action in .204 Ruger (shooting a 32-grain V-Max pill that was great for gophers and dogs, but almost

useless for marmots at longer ranges), as luck would have it, I was paired up with the guy shooting the Burris Eliminator system and the 75-grain Hornady .223 Rem. rounds.

On day one, our guide took us between gopher and dog towns to the high edges of river bluffs that over looked alfalfa fields along the river bottoms. Approaching the bluffs, we would stalk to the edges and glass the fields in search of the elusive marmots that lived on the fresh greenery below. Shooting ranges would vary a bit, but, in general, were found to be from 400 to 600 yards. With a slight breeze building as the day heated up, this was a exercise in wind doping, to be sure. Even though marmots are large critters, about five to eight pounds, more than a foot long, and half again that wide, when they're 500 yards or so away, that big target gets real small in a hurry.

As my New York City shooting partner was a copy editor rather new to the business of dog shooting and, admittedly, didn't have much if any experience in the art of long-range shooting, it was interesting to watch how he acclimated to the Eliminator scope. The bottom line was that, when confronted with crosswind, extended range, and a very small target, he didn't hit much of anything. As good as the Burris Eliminator is, it still requires knowledge of the basics in the rifle shooting arts. While drop is taken care of and range figures are right in front of you, the wind and bullet ballistics are still factors for which the shooter must adjust. Are the folks at Burris working on that? Yes, as a matter of fact, and it is possible we will see a later generation of this scope with wind calculations built into the system. But, for now, learning to read the wind and

understanding how it affects bullet behavior in flight is still the best game in town.

With some warm-up time with my rifle finished on day one and with a few long-range kills tacked onto the score board, day two was the real kicker, when it came to getting that Eliminator into action. With groups of shooters moving off into dog towns in search of big kill numbers, I hooked up with Roger Cox and Marcus Smith, a couple ranch cowboys and guides who knew where the best, high mountain rockchuck populations were located. With us we had the two M&P-15s wearing their new optics.

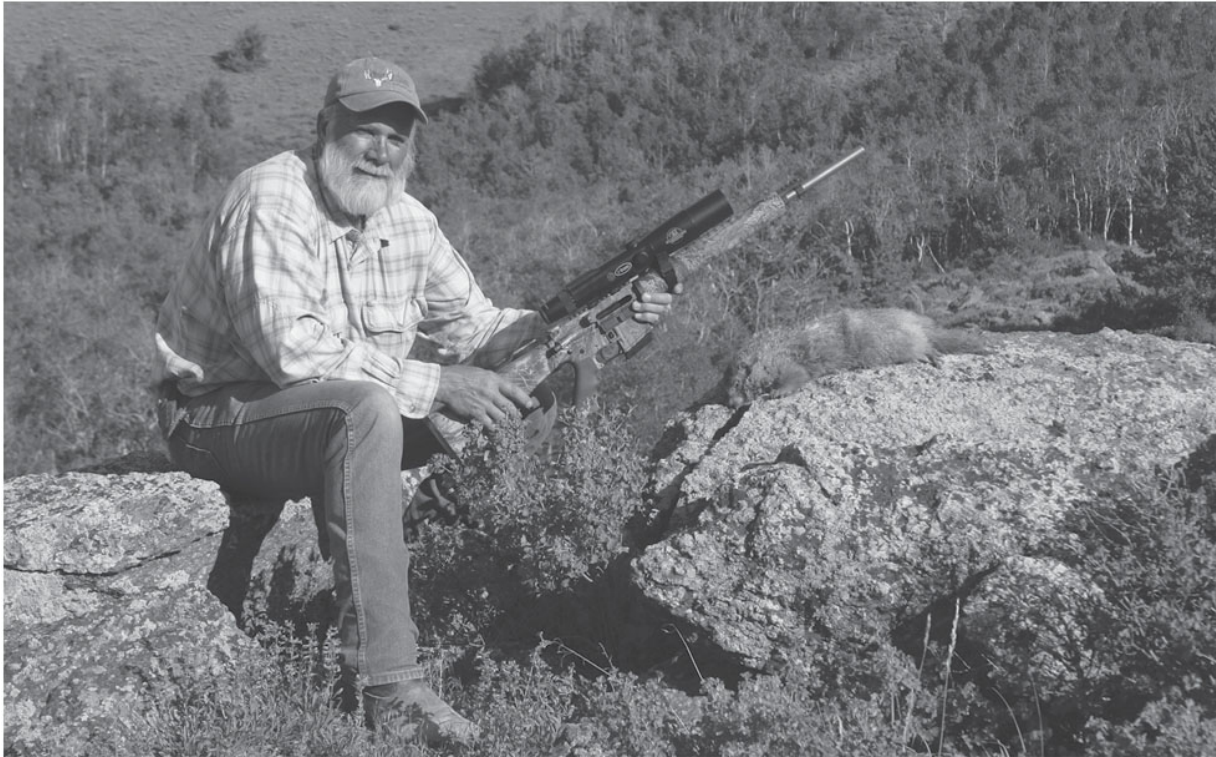
After grinding through rutted two-track trails and over sharply rocked fields I was sure would blow out all four tires on the 4x4, we reached an elevation of about 7,000 feet and the large, rolling boulders of the high lonesome country. This was 'chuck country bar none and, with several Steiner Police single-focus field binos, the glassing started in earnest for the marmot's small form. We found them, most at a solid 550 yards.

I located a fat 'chuck sunning itself on a rock ledge. Ranging the critter through the new Eliminator, the figure 356 yards flashed up in the window and the bright dot had moved off center (the 100-yard zero), and about two Mil Dots down the grid line at the six o'clock position. As for the wind, well, it was not at all friendly, and my guide, a long-time big-game hunter in Wyoming, speculated a full Mil hold to the left would be required. At the shot, that bright spot of light pushed to the left, the chuck came apart, and what was left of him catapulted toward the sky. My cowboy friends were impressed, as was I. This scope was about to find a new home, for sure.

Back to glassing again, now further out on the rock ledges, produced another target. This time the ranging system indicated the chuck to be a full 585 yards downrange. Thankfully, the wind had, for the moment, lost some of its force and, in fact, while it was now blowing left to right at our shooting perch, it was completely reversed at the target, judging by the movement of the soft, light grass at the base of the bolder on which Mr. Chuck was sunning himself. My partner Roger was shooter up, while Marcus, our young cowboy in training from Greenwell Springs, Louisiana, set up on the truck's window frame for a back-up shot if needed. I'd turned to spotter duties for the time being, as Roger steadied his rifle and, with the push of a button and the data locked into the system, decided to take a chance at doping the wind as zero. With the bright light dead on the chuck at the indicated 589-yard range, the cowboy squeezed the trigger. At the shot, the chuck started running across the wide boulder top before flying off its end and into the air, dropping a full 25 feet to the grass below—and hitting the deck in a pile of dust, it was clearly evident that this rockchuck was stone dead (no pun intended). Considering everything involved—the AR platform, the .223 cartridge, and that remarkable scope—the only thing I could think of was *Nice shot!*

Roger himself was delighted at the shot, as he had spent far too many rounds the previous day trying to get a hit on those long-distance marmots. He'd told me that, at the time, he felt that tools like the Eliminator were, for the most part, gimmicks to sell product, but now he was singing a very different tune. Burris had sold another scope, and Roger would be allowed to get in line right behind me

when those first tubes came rolling off the production line later in the summer.



Roger Cox with a rockchuck he drilled at 600-plus yards via the Burris Eliminator atop a .223-chambered Remington R-15 firing 70-grain Hornady bullets.

When first laser ranging scope was designed, it was just that, a rangefinder in a standard scope. It worked, and I still own one, but the battery life was very short and all the scope did was range objects. This new model Burris laser ranging scope obviously can do much more, and to a much greater effective degree. The number of range readings can run as high as 600 before battery life wears down—and I don't know anyone who fires 600 shots in a day. In fact, after two full days of constant use during that writer's hunt, the power cells on both Eliminator scopes were still going strong.

Ranging objects is possible to a full 1,000 yards; when the digital window shows the number 000, it has hit that maximum. Anything less than that and the figure displays exactly. I ranged antelope to 758 yards on that trip, clearly noting the exact holdover required to make a hit (less wind deflection). In the high country, elk were observed and ranged twice to almost 700 yards and, to be sure, these would have been dead-as-a-doornail critters, if tags had been in hand and the season in. In other words, if the bullet is physically able to get to its chosen designation out to 1,000 yards, the scope can tell you how to get it there.

Of course, a scope that can do what the Eliminator does comes with a price, usually in the thousands. I know, because this has been a part of my research and story for some years to date. The Barrett .50s and .416s, the .408 Chey Tacs and their brethren, all use advanced ranging and drop assessment systems that, when combined with the rifle, cost as much as a new Harley Davidson motorcycle. The military has a sniper's second (spotter) unit that identifies and computes via a handheld computer to get the same data Burris returns in *milliseconds* through the eye of the glass sight. No matter how you cut the deck, this optic is both effective and has the real ring of a better bang for the buck. Buy a scope and go shoot stuff about as far as you can see it? Now that's a program worth checking into.

Seems I'm not the only one who thinks this. The folks at Steiner have also hit the decks running, with some big developments in lower-cost glass that will allow the average hunter to acquire better optics. Steiner will be fitting several test rifles this year with some of its advanced and price point-reduced glass for field testing. I'm excited by this move and, for the most

part, it's about time these guys start marketing to the bulk of American shooters in the field today. It will be nice to have them join in and keep pace with Weaver, Redfield, Nikon, Bushnell, and others who are all solidly on board with ever-increasing lineups of high-quality optics at fair prices.

WITH TWO EYES

Let's switch gears for a bit and look at the other glass you're going to need for long-range shooting. I'm talking about your binocular.

As it is with scopes, at no other time in our modern history has observation equipment made so much progress. With the first edition of this book, I covered this subject and thought I'd hit the nail about on the head, but oh how wrong I was. The current trend in optics has pushed the entire field of binoculars, spotting scopes, and combined ranging equipment right off the charts. Some of the gear is downright affordable, too, which makes a case for the young or less well-healed hunter who wants to get into the long-range rifle shooting game.

Swarovski

It was the summer of 2012, when I got hold of my first Swarovski EL Ranging binocular. I was hunting prairie dogs in Wyoming with O.F. Mossberg, during the first real-time testing of the then-new MMR Tactical ARs and the also new MVP Varmint, a 5.56mm bolt gun that accepts AR magazine. East-central Wyoming opens to very wide valleys that reveal a great deal of distance between one group of dog lodges and another, at times. I was pressing the new rifles into use via Swarovski varmint optics—which are in a class by themselves—in most cases against targets a solid 500 yards and change in the distance. Even on the flat surface of the open range of Wyoming, the Swarovski EL binocular was planting its laser dead-on target and never failed to return a range recording. Two years later, I

have that ranging bino in the truck at all times, and it's aided me grandly in spotting and ranging trophy-class big-game, turkeys, and coyotes, as I roam across western South Dakota with a rifle day after day.

Unlike the Burris Eliminator, these optics need no long story of development or obvious value. Swarovski glass is not and never has been low-budget—then again, neither has this kind performance. What equipment like this can do, just as it did when testing sniper rifles for another section of this book, was allow precise measurement of targets beyond 1,000 yards. I could even watch the vapor trails cutting through the air, as made by .30-, .338-, and .50-caliber bullets. Believe me, in my circle of rifle shooting friends, and that's quite a pile of shooters out here in the wild western United States, nothing comes *close* to these EL binos for fast-handling, lightweight, and accurate field range estimation.



Swarovski's EL Ranging Binoculars. They are very accurate to 1,000 yards.



Ranging with a Swarovski EL series bino.



Good ranging equipment can help make that first shot the one that counts.

Steiner

Steiner offers no less than seven different models of military/tactical-type scopes, well supporting a military-based world market for its glass products. Recently, Steiner has offered up its 5-25x56mm military sniper scope, an optic designed for shooting out to 1,500 meters. Its tube retains a 34mm tube diameter, the front focal plane A2 system, and a Mil Dot reticule. I put this scope on the Weatherby Mark V in .338 Lapua, because of the cartridge's inherent long-range capabilities. At another point during the writing of this book, the tube was shifted to an AR30A1 in .300 Win. Mag., when the targets to be engaged were beyond 1,000 yards on the Missouri River hills of South Dakota.

A second Steiner scope, one also mounted on a test rifle for inclusion in this book, was the new Predator Extreme varmint scope. I had it mounted on both the first test AR30A1 in .338 Lapua and the second AR30A1 in .300 Win. Mag. With a reduced weight compared to the Military variant, it

is a bit better suited for positioning on a rifle for a deer hunt or for use by snipers in urban police operations, rather than “bermed in” shooting situations. As it turned out during the review, the .300 Win. Mag. in this configuration saw a good deal of service both on the steel target range and in the field against warm targets. At a power range of 4-16x in a 30mm tube, the Predator Extreme proved itself to be a light gathering class act and, so, should do well on the market among prairie dog, song dogs, and cat hunters.



This is Steiner's military Predator glass on an AR30A1.

Bushnell & Weaver

Another scope that caught my attention is the Bushnell Elite Tactical scope. I see this one as a sound choice for mounting on an AR-type platform chambered in .223/5.56mm NATO or .300 AAC Blackout, as it was primarily designed to work in conjunction with mid-range tactical

rifles. So often, when it comes to scope choice, the AR rifles have a log attached to them. Giant scopes, though, make them out of balance and top heavy, not something someone who needs a maneuverable gun would ever want, to be sure. This scope, on the other hand, came away with high marks. With a 1-8.5x magnification and a 24mm tube, the scope package is a good fit for the M-4 level platform. Be advised, if you're used to Bushnell products that are easy on the budget, you're in for a bit of a surprise. This is a huge step up from the economical fodder the company also produces, as the Elite Tactical is Mil Spec-grade equipment and, as such, retains a high level of quality materials and workmanship.



One of Steiner's military sniper Mil Spec optics on a Weatherby Mark V in .338 Lapua.



This is a .264 Winchester Magnum ready for zeroing for distance work. This space runs 600 yards—you need this kind of range when testing both rifles and glass.



Turret knobs are sometimes required for fast downrange corrections. Here they appear on Steiner's sniper glass.



Steiner's auto-focus binocular, from its Police lineup.

If the Bushnell Elite Tactical is too much for your wallet to bear, the new Weaver KASPA Series in the M-4 platform 1-4x24mm FFP Tactical scope could be the answer. It's a smart contender in the class of optics designed for mid-range use on those same .223/5.56 NATO AR platforms. I used this scope during a badger hunt in Wyoming I talk about elsewhere in this book,

and it tended to hold up well and got the job done on targets inside 300 yards.

Redfield

As the name Battlezone Tactical Rifle Scope implies, Redfield, now a part of Leupold Optics, is staying right in step with the trend in warrior thinking by offering a tactical-based sight in one-inch tubed, 6-18x44mm scope that retains external adjustment knobs for fast elevation or windage changes. It is sized to fit the current rash of AR rifles, as well as turn-bolts. Using MOA hash marks and ½-MOA settings in the reticle, then tying in the crosshairs with heavy outer bars so as to allow targets at closer ranges to be picked up quickly, this rifle glass is a nicely thought out package.

Testing of this scope was accomplished by mounting it to the .300 AAC Blackout. With that setup, I sent the new Barnes TAC TX M/LE bullets out to 400-yard steel targets. With the bullet at 110 grains, there was ample velocity from the .300 AAC package to get there, but getting it there and on target happened because of the MOA elevation indicators displayed on the Redfield glass. With ¼-MOA adjustments on the turret, I found this scope easy to use. Too, with the quick-lift, free-turning adjustment caps, the zero and return to zero were accomplished effortlessly. If the turret is moved off the returned zero mark, you know that there has been a subsequent change in the 100-yard impact point.

An interesting feature of this scope is that, under low light conditions, the crosshairs turn a dull white, something along the lines of a photograph's negative appearance. This allows easy target acquisition during use, say, in nighttime coyote calling or other low light activities. Overall, it seems that Redfield is back, and I'm happy to have this scope join my several 20-year-old varmint Redfield scopes that stay in service on a bevy of my long-range turn-bolt rifles.

Nikon

The “M” in Nikon’s model designation M-308 stands for “military-based.” In this wonder-scope, you get a new way to perfect long-range shooting, thanks to the fact that this optic flat-out calibrates the turret adjustments to fit the exact ballistics of a .308/7.62 NATO 168-grain hollowpoint bullet. With so many .308 ARs now being sold, as well as the vast number of turn-bolt .308s in service around the world, this scope has found a real home and purpose.

The M-308 makes use of what Nikon calls its BDC 800 reticle (BDC = bullet drop compensating). The very small circles in the crosshairs indicate evenly distributed 100-yard increments out to 800 yards. After a 100-yard zero, simply put the desired circle on the target at the given range and shoot. The hold-over has already been built into those small circles. For half-range distances, the reticle also has hashmarks between the circles, used for plus/minus 50-yard elements. Turret adjustment happens via the pop-up-style knobs. They can be used with or without the aid of the reticle ranging system.

A SPOTTER FOR THE BOOKS

There's an old saying that goes like this: "If you can't see your target, you can't hit it, either." This is where a good spotting scope comes in.

It should go without saying that much of long-range shooting involves the use of a spotting scope, either by the shooter or by a partner spotting for them. The work for this second book naturally mandated the use of a spotting scope, and all that work was done by the new MeoStar S2 82 HD by Meopta Optics. Built in the Czech Republic, this 30-60x spotting scope stands right alongside several of the big name brands on the market today.

Meopta builds scopes, binoculars, and spotting scopes for every facet of the shooting public. I started to take notice of the brand when in Russia, during 2013, hunting boar. There I saw Meopta glass on many of the French hunting rifles, as well as those of the German and Swedish members of the Norma Ammunition test team. Due to the fact that Russian boar are not considered the most docile of critters, hunters depend on quality and effective equipment quite literally to stay alive in the event one of those monster hogs, dressed in all their nearly impenetrable body armor, decides to roll straight over you while you're taking the shot.

Now, what I won't do here is try and snow anyone with the fact that I am some kind of expert in the area of quality optics. Still, I have looked through far more rifle scopes, spotting scopes, and binoculars than a pile of other folks out in the great outdoors today. That kind of experience counts for something, not the least of

which is a wide field of optics to compare against whatever's in my hands at the present. To that end, what I can say is that the Meopta's clean image, brightness, and lack of flat or dead areas in shadows are well represented here. Setting up this spotter on our 1,000-yard range, as well as over 1,500- and 2,000-yard dog towns in western South Dakota, proved about as solid a test as possible for this top-notch optic. This glass was so good that watching vapor trails all day long was common, when pushing .50 BMG, .338 Lapua, .300 Win. Mag., and 7mm Rem. Mag. rounds to prairie rats and their lodges well out to 1,000 yards and more.

At a price range of roughly \$1,800 to \$2,300, depending on eye piece configuration, Meopta's MeoStar isn't an inexpensive piece of equipment. Yet, compared to others in this price class, as well as many priced higher, this optic holds up very, very well. It is absolutely worth your while to examine this brand and its products the next time you're ready to up grade your optics.

I have shot this scope on ultra high-power .50-caliber muzzleloaders built on Mauser 98 actions, a .22-250 Remington in a Savage Predator rifle, and additional .308 NATO target rifles. With the Savage 110 .308 NATO in its sniper variant, after zeroing, the rifle shot *exactly* like it was designed to do. Reticle designs like the BDC are very solid, because they are simple, easy to use, and take away at least one hazard of long-range shooting, and that is estimated hold-over. (Just remember, this is about hold-over/under, not sideways windage issues.)



Crosshairs on target.

WHAT'S NEXT?

I am sure that, before this book reaches the printer, at least four or five brand new advanced sighting systems will have been brought onto the market. Remember, if you can't see it you can't hit it, and also as added to that old line, if you can't sight it correctly, you're not going to hit it. For instance, as I write this in early 2014, I'm seeing news of a totally new tool, the Optimizer Horizon, as offered by R.D.S. Technology. This amounts to a wheel-driven mount that can be applied to any scope, and the mount itself drives the adjustments for proper bullet holdover out to 600 yards. Change the round or cartridge and change out the wheel. I haven't seen this unit yet, but it certainly shows that innovation is at work.

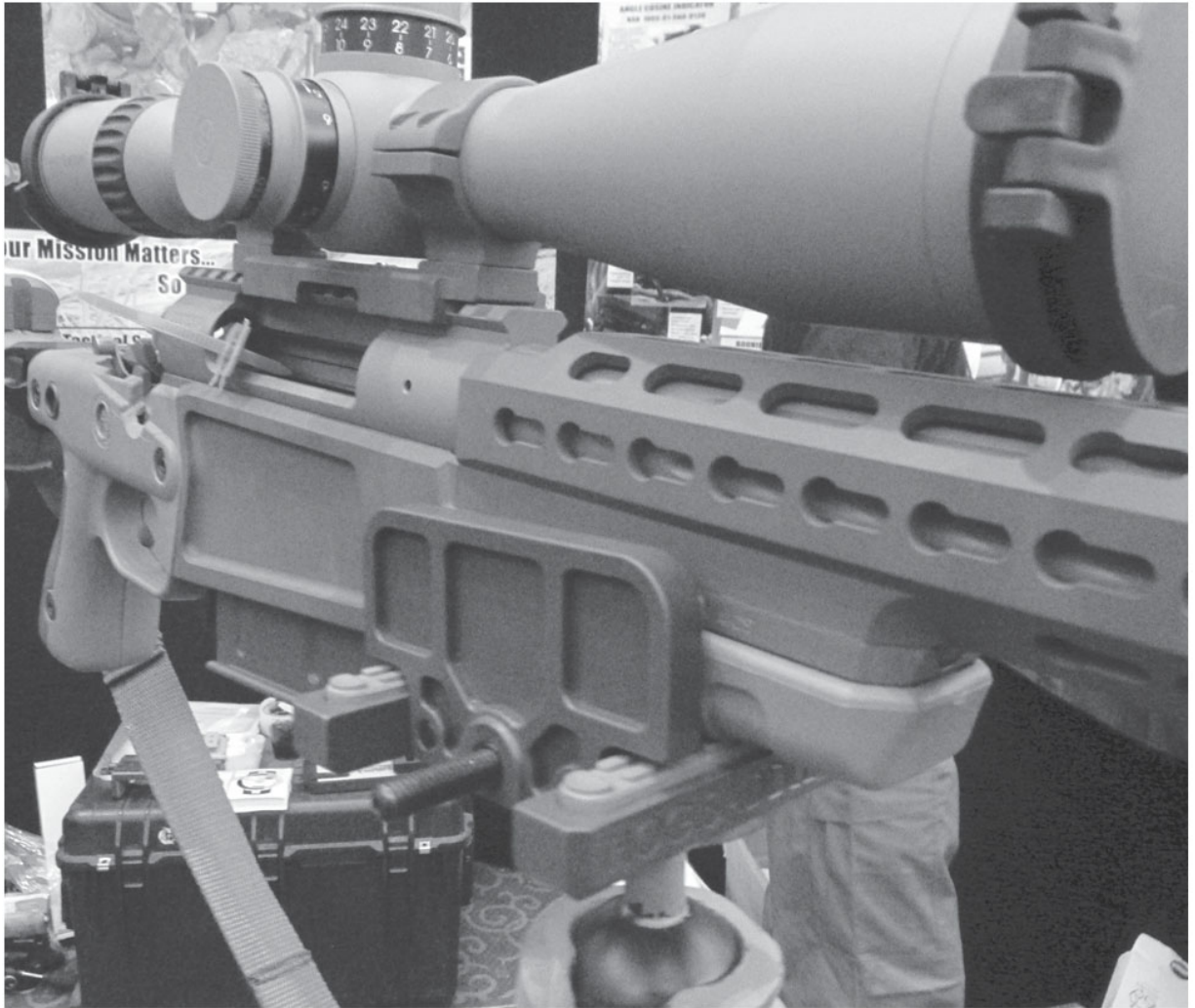
If you want to stay with electronics in target acquisition systems check out the brand new FLIR ThermoSight RS. This first of its kind commercial rifle scope is a day or night targeting unit using the famous FLIR thermal

core. That core is the guts of a night location system that sit on the front of battleships—and now you can have a smaller version mounted to your rifle. I have no cost figures for this yet, but FLIR has indicated that it is going to be affordable.





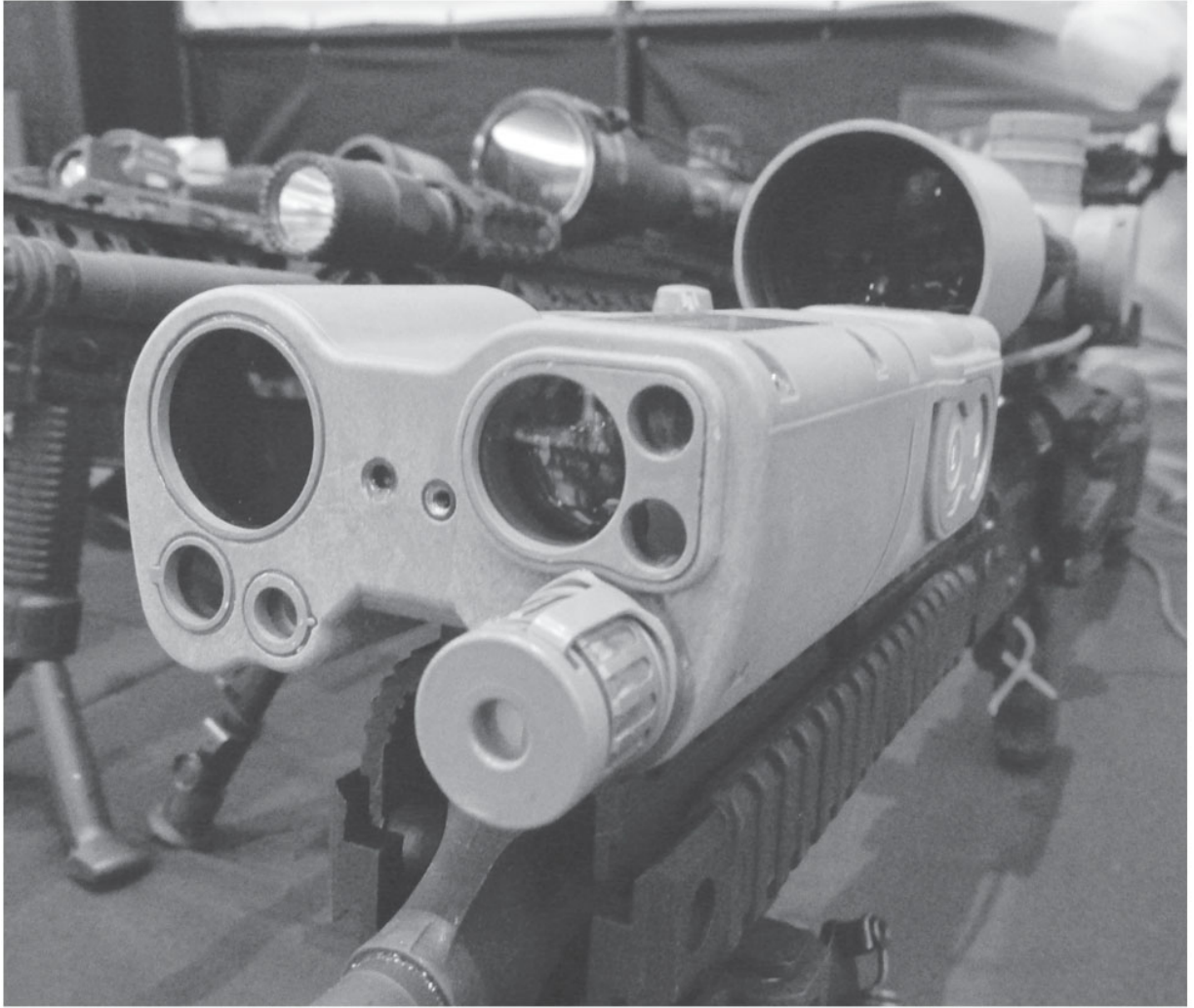
Ranging system advances will move from military-oriented to sporting overnight, so says the author.



Heavy metal sights, those optics for big-bore rifles, are gaining in popularity among riflemen.

KNOWLEDGE TRIUMPHS OVER TOOLS

As fabulous as so many of our sighting tools are today, what I've been seeing, over the past five or six years, is a major effort by designers and manufactures to take away the need to understand how to shoot without all the toys and aids associated with automatic doping distance and wind. Of late, it's even been suggested by some major brands that the "old days" of knowing how to dope range elevation and wind aren't even required any longer. To that I say, "Nuts!" When the toys fold up under stress, weather, or a long drop off a high place in the mountains, you had better have some skills to fall back on, my friends. As I have stated all across this book, there is no substitute for understanding your cartridge and rifle and developing the skills necessary to use them well.



High-tech optics will never replace tried-and-true knowledge and experience.

CHAPTER 9

RANGEFINDING ESSENTIALS



When you only get one shot, you want to know how far the target is from the muzzle of your rifle.

WHEN YOU SHOOT AT long-range targets, you need to know how far away that target is. With bullets dropping like rocks much beyond 400 yards (Rule of 400), you will need to learn the correct holdover, sight adjustments, or the use of sniper Mil Dots and the like. This is the most important element of long-range shooting, because lacking this knowledge, you're just another artillery piece out there sending flak at the target.

Ranging devices are more than just a single approach to the problem. When I was a young shooter, I started by using telephone poles along roadways as a guide to show me the gap that existed between 100-yard points. I used that technique for so long that, after a time, the gap method of ranging became quite natural.

Learning to shoot by estimating distance to a target by utilizing known distances of surrounding elements (like the gap between those telephone poles), is not only a decently good method, but, being self-generated it won't cost you a dime. What you have to do first, of course, is learn what most accurately represents 100 yards. Use those phone poles, football field markers, or anything that comes along that illustrates this specific distance. After getting a solid handle on what 100 yards looks like, go into the field and start establishing that range on natural markers—odd trees in the open, rock clusters at a distance, or even clumps of grass on open country. A fence line can really be of help here, as can irrigation pivots. Know the distance between two points and your gap-ranging skills will start to come together.

I believe that accurate gap shooting can be accomplished with practice to about 400 yards, with reliable accuracy. To start, after measuring that first 100 yards in your mind, jump ahead to 200 yards using a second marker. Now, stop at that point and actually measure off the distance or pace it off. This will give you a clear indicator of your distance estimation abilities. It takes practice.

If there is one area that gives everyone trouble when trying to estimate range, it is shooting in mountains or areas that have deep draws, as well as those habitats defined by differently shaped hills and ridges. I've played a game with friends, where several of us will take a crack at guessing the distance to an object, then ranging it with proper equipment, usually

discovering just how much we were all off target. That's what leads me to the real topic of this chapter, mechanical rangefinders. These are nice tools to use, of course, because they take the guesswork out of the process. I know, you're now saying, "If I have a rangefinder, why bother with the gap system?" Well, battery operated things fail all the time. If you don't have that set of personal ranging skills honed, what are you going to do when that trophy is standing in front of you? Believe me when I tell you that having both systems has saved the day for me more often than I can count. That gap system is never any farther away than your mind and eyes.

AFTER 400 YARDS

As I've said, the gap method of ranging, when practiced, can work well out to about 400 yards maximum. Stretch that range limit beyond that and trouble starts to raise its ugly head. As human's, our physical capabilities are, of course, limited. Figuring an exact range, and sometimes even an approximate range, at very long distances, can be a real problem. Simply put, we're just not good at it. This is where the use of a mechanical rangefinder is a good idea, even a requirement.

Way back in the early days of ranging equipment, I bought the simple and effective Bushnell Yardage Pro 400. This rangefinder made use of a monocular eye piece, but the unit also opens out to a binocular design, thanks to the mounting of a pair of lenses at the exit side of the unit. Along with that Bushnell unit, a Tasco Lasersite ranging unit of a single lens design, but equally as large as the Yardage Pro, also showed up for evaluation from the manufacturer. The Tasco was designed with a ranging capability to 600 yards. This was all some time ago, of course, but it was apparent, right from the start, that the distance game was starting. Now,

some 15 years later, and as advanced as the current batch of ranging tools is, it still hasn't ended.

With those first units to come out, right off I turned to my old system of gap ranging, but now I had a second option, and that was to gap range with the optical rangefinder first. Yes, you read that correctly. I would first gain a recorded range, say 300 yards, using the mechanical unit. After marking that range by identifying a downrange object such as a tree or rock, I jumped that gap in distance by a factor of one, out to 600 yards. While not dead-on accurate, it was effective in getting me close to a working range for the rifle and cartridge I was fielding on a given day.

How did I do this? Taped to the underside of my rifle's fore-end is a drop table for the bullet I'm using in that rifle. By making a quick check of that table, I can compute the bullet drop based on my estimated range to the target. After taking into account the amount of bullet drop associated with the range where my target sits, the next step is to compensate for that amount of drop by elevating my sight via the vertical adjustment knobs on my scope or by the invaluable Mil Dots located in a nice, neat line on the vertical crosshair. Most often I opt for the Mil Dots, as they are quick and I don't lose zero in the event I'm required to take a second quick shot at a closer range; I say this in reference to hunting, not target shooting, as anything can happen when it comes to setting up on game animals. On more than one occasion I can remember taking the long shot on a song dog well out to 500 or 600 yards, only to have a close-range canine partner of his jump up at 200 yards and right into my scope. Say what you want about my system, but I don't like to mess with my zero setting any more than I have to. It's old school, but it works well for me.



Weaver's newest 1,000-yard, mid-price range laser rangefinder is an 8x28mm configuration. Waterproof, it measures in feet, yards or meters, your choice.

LONG-DISTANCE RANGING

In some cases, long-range shooters work from static positions, meaning situations in which they don't intend to move much. If they do move at all, they'll set up elaborate ranging systems such as military artillery-range equipment or very advanced compact commercial units. These shooters are in a separate class of long-range riflemen in which the goal is to send their bullet as far away as possible and still be successful at hitting a target. For these shooters, of course, the use of the gap ranging method or any other shorter-distance ranging system is out of the question. The name of their game is technology.

Today, there are rangefinding units that can integrate with the rifle scope and allow on-the-spot adjustments for 1,000-plus-yard targets simply by dialing them in, setting the elevation adjustment for drop compensation, and touching off the round. The Burris ranging scope discussed in the last chapter is an excellent example of this kind of technological advancement. With that scope, you have a tool that retains its own ranging functionality out to 800 yards and allows the shooter to dial in a target without any additional support equipment whatsoever.

On the more basic and practical side of things, using one of the many general-purpose rangefinders available can meet almost all your needs in the long-range field. Believe me when I tell you that you can get by with a lot less than the Burris Eliminator, if you build confidence in yourself behind your rifle. I hunted most of my adult life without any of the tools of today's long-range riflemen. I did have my grandpa Jake Domning, as a boy, who, because he'd been an old salt on a U.S. Navy battlewagon during the Spanish American War, knew something about hitting stuff way off in

the distance. He started me out with a Model 94 Winchester .25-35 with iron sights, an extra-long magazine, and some darn good advice. “Aim small, shoot small,” he used to say.

Anyway, you can spend just about any amount you like for a rangefinder nowadays. Just try to keep in mind exactly how you’re going to be using that tool, because bang for the buck is always a good idea, even in ranging glass.

For the price conscious, Leupold is well worth a look. American-made, dependable, and accurate in the field just about says it all about Leupold. I use a lot of Leupold products, because they tend to get the job done without many of the common problems often encountered when hunting. Leupold’s compact RX line (Leupold currently offers six rangefinders in this line, including one for archers, with prices starting around \$275), of digital rangefinders are a class act, though they do retain added features you may not need or want. Remember, the primary purpose of a rangefinder is to find out how far away something is. You probably don’t need your rangefinder to be half-yard accurate to 125 yards, since you should be able to range that distance without a mechanical rangefinder, but the RX units will do that for you nevertheless. You also might not have need for a variety of reticles, but you’ll get that, too. Only you know whether a feature is fluff or necessity. For instance, I still find that I basically bring my up rangefinder, read the range, and go back to my scope and its Mil Dots for any required elevation.

On one of my many trips to Wyoming, to test optics and other equipment, I recently got to use a rangefinder with the ability to tell you how far the goods are out to 1,000 yards. The unique thing about this one is that it carries a price tag under \$400; shop hard and you could find this unit selling around \$275 and change, a price point more applicable to a unit with a 500 yard or less capability—well, maybe with most brands, but this is a Weaver

rangefinder I'm talking about, and now that Weaver is under the control of ATK (Federal Ammunition), it's stepped up its game and produced a very capable system.

I used this 8x rangefinder over a full week and on hundreds of targets, without a single failure to return positive data. At 600 yards, this unit will record big game clearly. I tested it on antelope and mule deer, as well as cattle, to a solid 800 yards. The 1,000-yard maximum was verified by ranging larger reflective objects, including stock tanks, small ranch buildings, and rock piles. When it came to confirmation through shooting, the unit resulted in a bunch of longer range prairie dogs, gophers, and badgers meeting their maker with direct hits from a T/C .22-250, a 7.62x51 (.308 Win.), and Hornady special high-performance long-range .223/5.56mm NATO rounds.

One rangefinder that was used for a great deal for this book was the Swarovski LG. This unit is very small, about the size of a pair of opera glasses, but it ranges to 1,500 yards and, at times and depending on the target, beyond. I found it quick to lock onto very long-range targets, requiring only a small subject like a rock, tree, or brush to produce a bounce-back laser reading. This unit is not a budget item—the lowest online price I found was \$700, with most being closer to \$900 and \$1,000—but it is very dependable and it will take all the guesswork out of establishing a target's range.

Bushnell, another company well-known in this business, offers a complete line of ranging equipment. The most minimal device, the Sport 850, will run you just a bit under \$300, but will get your range readings to 850 yards. On the other end of the spectrum is the newer Elite 1600, which will reach all the way out to a stunning 1,600 yards, though at a price of \$850.

Simmons Optics offers its laser rangefinder, the LRF 600, for just a smidge over \$200, and, to be sure, these units get the job done. Nikon currently lists eight different units in prices ranging from as much as \$480 to as little as \$150. In terms of pricing I'm staying as close to my information sources as possible, but don't hold any company to an exact figure. Do your shopping, especially via the Internet, using the information here as a general guide in selecting ranging equipment.

In the ultra high-grade department, Leica sells the combination rangefinder and binocular Geovid HD-B for up to \$3,000. I have used a similar model when hunting rockchucks in Idaho, during days when I couldn't make out a thing with a cheap binocular. The 'chucks were exactly the color of the rock and, when sitting still, they were lost to the grainy formations surrounding them. The Geovid picked them out and also returned exact ranges well out to 800 and 1,000 yards. In my opinion, these are professional devices, tools designed for guides hosting high-end clients hunting sheep and other expensive trophy-class game, or military snipers requiring far more exact measurements to the target than you and I would normally use. Again, you need to think your application through before spending that kind of money on a ranging system.



Rifle and rangefinder are always a unit, when setting up for a long-range shot. Lacking good ranging equipment when working at distance, you're shooting blind. What you can't see you can't hit.

One last unit to consider in the realm of high-end, specialized ranging units is one from Barrett, the builder of supreme, long-distance tactical weapons. Barrett created the BORS, which stands for Barrett Optical Ranging System. This unique unit is installed in the top turret of better-grade long-range sniper scopes and, in effect, becomes a ballistic computer for the shooter. As Barrett describes it, "After determining the range to target, simply turn the elevation knob until the BORS screen matches your target's distance. Internal sensors automatically calculate the ballistic solution. BORS compensates for temperature and barometric pressure, calculates angle cosine, and displays rifle cant." As of this writing, the BORS calculates only bullet drop, but advanced calculations such as wind drift and running shot lead are under development. Barrett's BORS will

allow 100 different bullets and velocities to be dialed into different ballistic charts within the system, and other advances under development will hold up to 2,000 calculations, making this tool one of the most flexible of mechanical ranging systems. With the basic computer corrections dialed in and the crosshair directly on the target regardless the range, it will make for a one-shot event—but beware, if this kind of technology is important to you, be prepared to spend for it. Without the scope, BORS units start around \$1,400.

If there is any question after this abbreviated look at ranging units, it is probably one of inquiring whether we becoming dependent on mechanical devices, versus a learned physical response to a ranging problem? In other words, is it equipment or practiced skills that make a good long-range shooter? It is easy to fall back on the toys and then forget what granddad taught us.

One exception to those questions would likely be this equipment in its use by military and police snipers. The army or Marine scout sniper needs all the tools he can get in his hands. So, if technology such as is found in the BORS saves the lives of snipers and those innocents around them, not to mention the lives of other boots on the ground, there is no discussion necessary. A life saved is worth the cost of the systems and the training involved.



Rangefinders come in all sizes and capabilities today. From left, the old Tasco 600, one of the very new Leupold compacts, and an old Bushnell Yardage Pro 400.

USING A RANGEFINDER

Hunting the rolling hills along the Missouri River in early spring can make for some outstanding prairie dog shooting. However, these dogs get shot at a whole lot by hunters coming across from Minnesota, Wisconsin, and Nebraska. Range can be a problem for shooters once the dogs get skittish.

Those skittish dogs were exactly what we had on one recent trip. They were everywhere, but, according to the rancher whose property we were using, getting close was all but impossible. One shot rolling down a valley put heads within 400 yards down for the remainder of the morning. Time for some drastic action.

The first thing our group of three shooters did was check the wind, moving towards the dog town while keeping the morning breeze, or what there was of it, directly to our backs. That meant that, as the winds built up during mid-morning and with the increased heat of the day, we would have the advantage of using the wind to push bullets, versus having them drift off course with a crossing wind.

Reaching a high ridge, we could see about $\frac{3}{4}$ -mile out across a long rolling valley. At the far end of the valley were a stand of cottonwoods and a small pond. It was there that we could see movement in all directions—grass rats by the dozens were out and feeding.

At once we moved down the valley, keeping a sizable hill between ourselves and those pothole rats. On reaching the crest of that hill, we got low and set up our rifles, shooting mats, and bipods. Pulling out a Leica Geovid from my pack, I ranged the dogs at just over 500 yards. Some were well out to 600 and more, but we figured we would start on the first line of targets and “walk” our bullets back into the crowd if they didn’t head down their holes after our first series of rounds had been sent.

I was shooting a Ruger M-77 MK II in .243 Winchester, while my partners were shooting a Kimber Pro-Varmint .22-250 and a second .243 Winchester in a home-built custom Mauser 98. My Mil Dot Redfield reticle had a series of dots at the six o’clock position and, positioning them above my target, ranged to 525 yards, at about 18 degrees, I set the dot directly below the crosshair’s center on a fat dog. I had zeroed my rifle for a 200-yard dead-on impact, the .243 Winchester developing about a 13-inch drop with a level shot. Since this was a downhill shot, the first Mil Dot looked to be just about correct. The crosshair stood over the dog’s chest at 14x magnification.

At the shot, dust boiled up just at the base of the prairie dog's lodge, about four inches low. I chambered a fresh round of handloaded 55-grain Nosler Ballistic Tip dog food, and this time I pushed the same dot right above the dog's head. As the trigger broke the sear and the rifle snapped, there was a slight delay, and then the dog came unglued in a cloud of dust and what was left of him. I had found the range, and the rest of the shoot then became about keeping the barrel cool, so as to not let the bullets climb, and maintaining a clear sight picture, as I proceeded to eat up prairie dogs with many successive shots. My partners, too, were quick to adapt to the situation. As a group, we pounded that prairie puppy town at long range for the better part of an hour, before moving on.

Another thing to consider when trying to get the most out of your rangefinder is to consider how you'll be using it. About the time I was writing the first edition of this book, I hunted Texas, along with the folks at EnvironMetal, Inc. The Hevi-Shot manufacturer was developing a new varmint bullet in .224-caliber at the time, and this pill needed testing at both long- and short-range limits. As some readers will know, the lands of Texas don't make for a user-friendly environment. The terrain is rough and full of heavy brush, open cuts, and more brush. Targets come into view quickly and leave just as fast.

We had a couple of days to get bullets on pigs, our primary target, with secondary possibilities going to coyotes and badger. We would locate activity, moving in first by vehicle and then on foot to get into position for a shot. Usually that shot would be at a moving and quickly departing target. Ranging was next to impossible, except by using a very lightweight and small unit like the Leupold RX II (the current generation at that time), which could hang at the ready from a rifle's sling or belt loop. With the RX II, I was able to pick up readings prior to the shot on several occasions.

What all this boils down to is that the biggest and heaviest is not always the best system to work with. Keeping size down and utility up can mean more productive results from your rangefinder under some conditions. Try to determine where and how your ranging system will be used. It can save you disappointment and expense in the long run.

WHEN RANGING EQUIPMENT WON'T WORK

Admittedly, there is some correlation between the price of a unit and its dependability, but, in some cases, and no matter the price, a unit may not respond appropriately because of terrain issues. Rangefinders require something to bounce a signal against, so that signal can be returned to the unit. When the ground is quite flat and you're at the same elevation as the surrounding terrain, many times the unit will not respond correctly, because it cannot acquire a solid object to use for that needed laser bounce. Even super-high-grade devices can run into this problem. In such times, I have found that I still need to gap judge the range to the actual target.

Always try and locate a solid object when you're ranging flat country. Even if the object is not exactly where you're ranging, if it is close, it will give you a starting point for your estimation. Remember about working with what you have, and that means bringing your own skills and brain/eye coordination together. Sometimes that's all you'll have to go on in the field. Ranging equipment is just that, and anything man-made can and will fail at times.

BUSHNELL'S FUSION RANGEFINDING BINOCULAR

Bushnell recently came out with a 10x42mm laser rangefinder binocular that arrived for testing just about the time I was asked by *Gun Digest* to write this second edition. With ranging accuracy out to one full mile, total waterproofing by way of Bushnell's Rainguard technology, and a host of other built-in options, I had to take this innovative bino into the field for some real-time hands-on review. My choice for this ended up being a trip to Mobridge, South Dakota, during the annual grain harvest. Testing my .338 Lapua and .308 sniper T/C project guns at the same time, it seemed the perfect opportunity to see what this new Bushnell product had to offer.

The Bushnell bino was used against two other proven rangefinders for accuracy comparison, as we placed 200-, 300-, and 400-yard steel plates for some mule and whitetail deer pre-season practice. At each target, the Bushnell marked and returned a dead-on accurate reference, in terms of exact range. Optical quality was good to excellent and, when used on a day that was dreadful in terms of frigid temperature, blowing sleet, and rain, the unit held up well, simply refusing to fog over or otherwise become a useless piece of glass and plastic in the field. In all, if distance is your thing but multiple tools and a lot of cash outlay aren't, this is a good choice for you.



Bushnell's Fusion is about half the price of some of the other brands of high-end ranging binoculars and produces excellent results in the field, something the author verified after rigorous hands-on testing.

JUST BECAUSE YOU CAN DOESN'T MEAN YOU SHOULD

What I'm about to say at this point in the ranging story will not fly well with some, but it needs to be addressed.

I have a problem with big-game hunters over-extending range in order to bag a trophy deer, elk, or whatever. I do believe the big-game sport hunter needs to curb their range limits, so as not to wound game in the process. While 600-, 800-, and 1,000-yard shots are very spectacular, I believe they need to be reserved for varmints and paper targets. Long-range shots on game are very workable, but long-range in this case should not exceed the dead-on killing limit of the cartridge and the shooter. In other words, give the animal you're hunting a break by working toward a clean, humane kill. At 400 to 1,000 yards, you know as well as I do that anything can happen to that bullet en route to the target, and the game animal will pay the price for a less than well-thought-out move on the hunter's part.

Some time ago, I watched a television program in which hunters were shooting elk from one mountain across to another. That, my friends, is no longer hunting, but an exercise in the use of advanced ranging equipment, rifles, and big cartridges. At best, it is simply shooting and little more. Be responsible when using these new and, yes, very effective tools. As we move steadily through the twenty-first century, we see new developments all the time in both guns and loads for long-range work. Word has it that some folks are in the process of building an ultra long-range sniper rifle off a Russian anti-tank gun system that will drive a bullet of about 37 millimeters to a target in the next county. There is also word that a 40mm sniper rifle is under development by still another group of experimenters. The point is to never say never, but always remember that nothing, regardless its size or design, takes the place of woodsmanship, shooting skill, basic know-how and, most of all, ethics, by the hunter in the field.



CHAPTER 10

BEST HANDLOADING PRACTICES

HANDLOADING CAN AND PROBABLY should be regarded as the lifeblood of the long-range riflemen. I don't know any long-range shooters who don't load their own. With the exception of a police or military sniper who will get all his training and field ammunition from a commercial source, the handload is not only an economical way to shoot long-range, but, many times, those handloads will be more effective rounds than those bought factory rolled and over the counter.

Well, at least that's how it used to be. It has often been stated that a good handload can outgun any factory load. Today, I'm not all that sure this is a true statement. Modern factory loads have become very good products and, as such, there are times when it is very tough to shoot a tighter group than what that factory cartridge can produce.

The primary problem with shooting strictly factory ammo is its cost. The price of commercially produced fodder is high, and that element is not going away any time soon. I'm not saying that hand-loading components are inexpensive items, but, dollar for dollar, you can shoot about double the rounds by loading your own, versus shooting the factory package in most long-range cartridges.

Getting involved in handloading for your rifle isn't at all difficult, but it will require you to do some reading on the subject and buy the proper

equipment. (Two of Gun Digest's newest books, *Handbook of Reloading Basics* and *Gun Digest Shooter's Guide to Reloading* will be a big help, if you've never handloaded before.) Because it may seem complicated at first, you may think you have made a mistake getting involved. Believe me when I tell you that, by loading your own ammunition and by that fact alone, you will become a better shooter. You will invest yourself in the development of your craft and, like most of us, will take great pride in hitting a target at 600 or more yards with our own handloaded ammunition.



**Handloaded bullets make for an accurate rifle,
and helps greatly in making clean, long-range kills.**

WILDCATS

Long-range handloaders will often opt to shoot a wildcat round, one that has been newly designed but usually based on a factory cartridge, whether current or otherwise. Such rounds will usually employ a bullet of different caliber, and some developers otherwise alter the case.

When we think of long-range shooting, we think of wildcats as fuel cells that drive heavier bullets very fast over a much longer distance. Also, most wildcats have been selected from cases that were initially factory loads for heavy game applications. As an example, the .257 Ackley Improved uses a parent case taken from the .257 Roberts. Such wildcat cartridges are always blown out a bit for added powder space, and sometimes the case shoulders are altered to develop a different burn or utilization of the powder during its burn time in the chamber. The end result is almost always an increase in performance, velocity retention, and/or accuracy.

The .257 Roberts as a parent case is just one example. Truthfully, it can be a pain to find in bulk, thus other wildcats are developed from easy-access cartridges like the .30-06, .243 Win, or .223 Remington. A .30-06, for instance, can be necked down to 6mmx'06 to shoot a bullet with a different BC, diameter, and grain weight. The .223 Rem. in a wildcat Ackley Improved is nothing more than a standard factory cartridge fire-formed with the first round shot from the Ackley Improved chamber, thereby opening the case up a bit at the shoulder to accept more powder when

handloaded and shot the second time around. (As a side note, the Ackley Improved rounds are generally quite popular. While some wildcat cartridges need to go through many levels of case reforming, the Ackley innovations make use of what is already in hand and, therefore, those loads often use a more simplified brass reforming system. Just fire old brass of the original caliber in the new Ackley chamber and you'll have a new wildcat case.)

Currently, wildcat load development has become so big that designers of cartridges in this realm will copyright their loads in the event someone wants to turn them into factory offerings. There's ample evidence that the commercial industry favors designs taken from wildcats. The development of the .25-06 Remington is a classic example of Remington taking this outstanding .25-caliber, necked-down .30-06 and making it a factory offering. Naturally, when this takes place, rifle manufacturers will often start to build rifles to fit the new cartridge. All the way around, it's innovation that leads to better times in the field.

I started to handload all my rifle ammunition about 60 years ago, give or take, in the late 1950s. In those days, we didn't have a whole lot in the way of bullets and powders, but we still had enough components to build an accurate round of ammunition and at a price that was affordable. Buying up 4895, 4350, and 3031 powders, we would head for our local supplier with coffee cans to be filled at bulk pricing from large kegs, when it came time to buy fuel for .30-caliber and other WWII military surplus rifles and long-range cartridges. The big rounds of the day for me were the .300 H&H Magnum owned and lent to me, at times, by a friend. As a second option, cutting back bullet weight in the .30-06 Springfield increased its ability to

shoot a flatter trajectory. Some work was done with the British .303 Enfield rifles and loads, but the '06 always seemed to win out in the end. I write here from a hands-on approach, even though there were many other options open to the riflemen of the day. The bottom line was that, as a young shooter and a student well into the mid-1960s, I could not afford much more in the way of range-stretching tools of the trade.

Early on, I latched onto an RCBS Jr. press and a lightweight Lyman Tru-Line JR turret press for several short-case cartridges. The 6.5x55 Swedish Mausers were everywhere, and darn cheap at that. Drop a 49-grain charge of 4831 behind a 120-grain Speer bullet in the Swedish case, and you had an accurate load pushing 2,773 fps.



Combined Technology's .243 Win. rounds being loaded for work on coyotes.



John Anderson shooting a Kimber Pro Varmint in .22-250, during the review of varied handloads in the field.

It wasn't that we didn't have hot high-velocity guns and cartridges back then—none would dispute the effectiveness of the .250-3000 Savage with its 60-grain pills punching out of the barrel at 3,522 fps ahead of a charge of H380. We also had the .257 Weatherby Magnum and .257 Roberts, the latter of which sent a bullet of 60 grains at 3,754 fps. This bullet was pushed behind H380 and 4320, to name a couple of fueling products of the day. Shooting 4350 in the Weatherby rifle, you could up your velocity to a very hot 4,229 fps and still shoot a 60-grain coyote killer for long-range work.

If these sound like speeds in use today, you're quite correct. The circle gets larger, but change is a slow-developing commodity in the new load business; the date of my old Speer reloading manual covering these types of loads is 1959. What we do see today that wasn't present in years gone by

are vast numbers of new cartridges that make the world of long-range rifle shooting very appealing indeed. Take, for instance, the families of WSSM and WSM cartridges, regardless the fact that they haven't really stuck around. What they have perpetuated is that more speed and accuracy with less powder is the new rule in the business of creating effective handloads.

AUTHOR-GENERATED HANDLOAD EXAMPLES

.223 REMINGTON

I believe one of the very best cartridges is the .223 Remington. It's a do-it-all cartridge that is the No. 1 round, in terms of popularity among riflemen today.

Case: Any clean and preferably once-fired brass case

Primer: Rem Bench Rest Primer SM

Powder: 26.0-grains H 335

Bullet: 55-grain Hornady V-Max

Bullet Seating: Just off lands (short jump)

Check all brass for clean primer pocket, correct neck length, full length resized.

MV: Approximately 3,210 fps, 24-inch barrel.

Note: I have observed this round take out prairie rats to 600 yards in dead morning air and warm weather. One-shot kills, not an artillery exercise. Group size at 100 yards inside .336-inch (a single rough hole).

.30-06 SPRINGFIELD

Case: Government or commercial brass.

Primer: CCI LR

Powder: 61-grains 4350. Note: Build carefully to this max load. Reduce by 10 percent for starting load and watch for chamber

pressure signs in brass and primer. In case of tight extraction or heavy bolt lift, reduce load at once.

Bullet: 150-grain Hornady soft-point

Bullet Seating: Just off lands (short jump)

MV: Approx. 3,065 fps, 22-inch barrel Winchester Model 70

Featherweight.

Notes: Kills big game to 425 yards (ranged).

.22-250 REMINGTON

Case: Factory

Primer: Win LR

Powder: 39.0 grains Win 760

Bullet: 55-grain Nosler boat-tail

Bullet Seating: Just off lands (short jump)

MV: 3,675 (calculated)

Notes: Very accurate and a great long-range dog load.

.243 WINCHESTER

Case: Winchester factory

Primer: Win LR

Powder: 43 grains 760 Ball

Bullet: 55-grain Nosler boat-tail

MV: 3,131 fps, 24-inch barrel Remington Model 700 VS

Notes: Lower velocity, but deadly accurate to 100 yards. One-hole groups. With other powders, this cartridge and bullet can be moved up to 4,000 fps

.25-06 REMINGTON

Case: Necked down .30-06 government brass

Primer: CCI LR

Powder: 47 grains 30-31

Bullet: 87-grain Speer soft-point

MV: Approximately 3,400 fps

Bullet Seating: Just off lands (short jump)

Notes: Accurate! Groups inside one inch at 200 yards.

NOTE: Reduce all loads by 10% as starting charges. Remember, handloading is a detailed process and neither the author nor Krause Publishing/Gun Digest/F&W Media nor their partners is responsible for accident or injury as a result of loading your own ammunition. Reasonable care was exercised in the development of these handloads, however, as powder lots change in burn rates from time to time and other components may be substituted in place of those listed, the handloader assumes all risk.

CHAPTER 11

CHRONOGRAPHING FOR ACCURACY



The author's chronograph unit along with the rail used downrange.

HAVE YOU EVER WONDERED how close the manufacturers' ballistics are to the real-world velocity of a bullet at a given range? Chronographing can answer this question. Have you ever thought about the difference in velocity between a boat-tail bullet design and a flat-base bullet? Again, it's the chronograph that answers these kinds of questions, not the numbers printed on the side of an ammo box.

Chronographing, especially at distance, is difficult and time-consuming, but the information the work returns is unique and generally well worth the

effort. Let's take into account the chronograph unit I use most of the time, an Oehler Chronotech Model 33. This unit has photo screens in double sets that need to be armored. In the event a bullet strikes low instead of going over the top of the photo screens, it must be stopped or it will destroy the photocells. Also consider that the screen width is only four inches, so the bullet has a very narrow line to cross that enables the computer to record its speed.

When using the Model 33 or a similar setup, you'll set your screens exactly four feet apart at whatever yardage you intend to chronograph, out to 400 yards. Next, you'll place a target backer directly behind the second screen, so that you'll have something at which to aim. Shooting from the bench, the bullet needs to pass screen No. 1, which sets off a timer in the computer that, by design, is in a wood box buried in the ground behind the armored screen. After the bullet has passed the second photo screen, the computer returns a digital record of the exact bullet velocity. You can set up these pairs of screens anywhere to 400 yards. If you're going to chronograph as far as 400 yards, it should go without saying that the rifle needs to be accurate enough to drive that bullet inside that four-inch screen window at that yardage. That means sub-MOA, less than one inch at 100 yards.



Brezny preparing to put a Kimber bolt-action in .308 through some chronograph paces.

Why not move the screens to 500 yards? Because, following the Rule of 400, bullets start to drop into targets after that distance, versus sailing through them on their initial and flatter trajectory. When I tried to determine a 500-yard figure, I got caught by a bullet that crossed the first screen successfully, but dropped straight into the second screen, missing the armor plate completely and ruining the screen.

WORKING FOUNDATIONS

In obtaining the testing results listed in this chapter, I had the help of my good friend Jim Korzenowski, who just happens to own a small farm in northern Minnesota, with a good house and enough open land to set up the 300-yard chronograph range. For the 400-yard work, a local farmer got interested in my project and allowed me to set up all my equipment for a

full week at a time on a vacated and mowed pasture that was table flat, had a good two-track road running the length of the field, and which sat right between two large wooded sections that kept wind to a minimum. Overall, the shooting that produced the results you see in this chapter took the better part of a full summer to complete. While I have not indicated every cartridge used in this long-range business in the tables on the following pages, I have included enough to give you a working idea of what different bullets will do at varied ranges. When adding other ballistic tables to your files, make a quick check of the websites for Sierra, Hornady, and any of the major ammunition manufacturers, and you're very likely to find what you're searching for.

Back in the late 1980s, I was chronographing shotshell loads. In doing so, I devised a system for measuring shot in flight that had not been created before. (In fact, it was considered impossible to measure pellets that were flying in a shot cloud.) After accomplishing the so-called impossible, I turned to rifles and the same method of finding information about bullets in flight.



A savage Model 10 LE police sniper rifle is used for chronograph work because it is accurate and gets bullets over those very small photo cell windows.

One of the very first things I found out was that I needed to have the muzzle of my rifle lined up exactly in a straight line with the chronograph screens. Any slight angle off this line and a bullet might cross the first screen but miss the second. I had to make frequent checks with a spotting scope of the rail that held my photo screens and allow for crosswinds that, at times, could blow a bullet completely off both recording screens. It was little wonder others had not given this kind of chronographing a try, as the method was full of pitfalls.

With heavy railroad tie plates as secondary armor set at 30-degree angles to my screens, plus a primary quarter-inch steel plate attached to the screen mount, I had a well-designed, nearly foolproof rig in the event a fast-moving centerfire bullet was on an angle to come into contact with the screens. That did indeed happen every now and again, and I'd hear the metallic slap of the bullet as it bounced off the heavy iron plate. I quickly

figured out that, at any range, I needed to keep my shots inside a square of four inches at any range, or I would gain no information from the screens.

The next step was to select rifles for the task ahead. At the time, I favored the .25-06 Remington (and still do). In this case, that round was chambered in a Ruger M77 MK II mounting Redfield varmint glass. A second gun was my Remington Varmint Synthetic rifle (VS) chambered in a .22-250 Remington. As I have previously discussed, this latter rifle is a close match to the Military M-24 sniper rifle and a deadly accurate tool, to be sure. For the very first tests, though, I elected to turn to a much lighter rifle, one in .223 Remington, again in a Ruger MK II, but in a heavy target configuration. This rifle had been in production for only a few months at the time, but I'd been told it was a shooter, and the better the accuracy I could get from a rifle, the fewer problems I would be confronted with downrange.

Bullet selections for the 200-yard shooting were the Speer .224 TNT at 50 grains, Berger custom 55-grain .224 pills, Nosler Ballistic Tip 55-grain bullets, and Federal factory-rolled 40-grain ammo. The Federal bullet was the top of the line at the time and, with its hollowpoint front end and flat base, it would be interesting to see how it performed. As the Speer TNT had a somewhat different shape from that found on the other .224 bullets, due in part to its extended ogive and heel roll, I wondered if I would see some difference in performance at the target. Berger's custom .224 had a flat base as well, but, again, a different ogive shape from that of the Speer bullet. It goes almost without saying, but the Nosler Ballistic Tip was at the top of the food chain, in terms of sleek bullet design. Bullets are like jet fighters and race cars, in that any small change in shape can and will affect their performance, sometimes greatly.

Looking at the tables that take up the majority of this chapter, let's break down the Speer .224-caliber 50-grain bullet. We see that even as close as 200 yards, which is a zeroing-in range for the .223 Remington, the bullet in the fourth test sample that started off at 3,229 fps is crossing the 200-yard photo screen at 2,212 fps. That's 51 fps slower than the bullet in the first sample test, which started off 55 fps slower out of the muzzle (3,174 fps, and falling off to 2,263 fps).

Can't happen, you're saying? Well, tell that to the chronograph unit, which, incidentally, was crosschecked every 10 rounds during the testing. In fact, it isn't rocket science to see that the bullets' velocity is jumping around all over the place. What causes all this variation to take place? A good deal more than we currently understand about bullet behavior. You know that movie scene where a sniper sits and hand-polishes the slight nick in his bullet's nose before going on a mission? Well, there just could be a whole lot to that small task. Any surface deviation in a bullet, velocity change, bullet exit attitude, or change in BC can and will change the terminal velocity. Nitpickers will check weight on each bullet used in competition or before reloading long-range ammo for to the hunt.

For long-range work, I was going to handload for both the .25-06 Remington and the .22-250 Remington. For the .22-250, I started with Calhoun Bullets in the 51.3-grain weight set atop a Winchester once-fired case with a Winchester Large Rifle primer and 36.5 grains of Varget powder. This bullet was a real beauty, almost too nice to shoot. With its silver-hued jacket topped off with a Nosler-style plastic point, the double hollow-based bullet had "Killer" written all over it—but I didn't know how it would fly. The .22-250 would also get a fair share of other 50- and 40-grain Nosler bullets sent down its barrel. Hornady followed with the 55-grain SXPS and a full metal jacketed boat-tail. Additional .22-250 bullets

included were Federal's 55-grain Premium Sierra boat-tail, and Winchester's CXP-1 52-grain hollowpoint boat-tail.

Next my attention turned to the .25-06 Remington, where I was counting on a flat trajectory to get bullets over screens at 400 yards. Here I would use only four loads. There would be three flat-based bullets—a Sierra Spitzer 87-grain, Speer's 87-grain TNT, and the Berger 87-grain varmint bullet—followed by a Speer 100-grain boat-tail hollowpoint.



The author at the bench preparing to do some long-distance work with the chronograph before hunting season.

When you're in wide-open country like this, you must know what your bullet is doing at that far-away target.

The bulk of the .223 testing took place at 200 yards. For the .22-250, I mounted the .22-250 Remington VS on my benchrest and reset my armored screens at the 300-yard mark. Rechecking my alignment to the muzzle and first screen, I chambered a handloaded Berger 55-grain bullet loaded to a muzzle velocity of 3,527 fps. Four rounds later, the muzzle average for the

handload stood at 3,511 fps, with the 300-yard average recorded at 2,401 fps. This gave the Berger 55-grain pill a 31.6 percent velocity loss of 1,110 fps.

Calhoon 51.3-grain double hollowpoints in .224 caliber were up next, and the Remington Model 700 VS pushed these bullets out of the muzzle at 3,464 fps. At 300 yards, the bullet crossed the recording screens moving at 2,325 fps, returning a net loss of 34 percent over the 300-yard run. This result tended to fit the profile, in that, when bullet weight was reduced even a small degree, the energy/velocity loss became obvious.

HANG TIME AND BIG GAME

For big-game hunters who have practiced enough and feel confident enough in their skills to take game outside the 100-yard comfort zone, there are a couple things to remember. First and foremost is the Rule of 400. Along with that, when it comes to your ammo, stay with one selected weight and brand of bullet when you have run through enough of them to know what you like using at long ranges. This bullet selection process will do several things for you. You will understand just how this bullet performs at the target and you'll also get a feel for the hang time of that bullet during its trajectory. Yes, it takes time to acquire this feel, and that is exactly why super extended ranges for hunting are not accepted by this writer in any way.

Here's the deal, my friends. Sight a 600-yard mule deer standing broadside and offering a stone-dead shot to the rifleman who knows his rifle, load, and sights. Say he's shooting a .308 Win. with a 175-grain boat-tail hollowpoint. That bullet will take a full second to cover that 600-yard distance—"One-thousand and one" by out-loud count. Count it out and in your mind while you watch a deer, bear, or whatever take a normal step forward. You just gut-shot that animal.

The television show *Myth Busters* did a test several years ago, where they set up a long-range expert marksman with a .308 Winchester-chambered rifle shooting at several hundred yards. I believe that the range was no more than 300. At that range, when a warm target spotted the muzzle flash, it could walk away from the

bullet before that bullet could arrive and strike the animal. This was not a human or live game test, obviously, rather it was accomplished (if memory strikes me correctly) with cameras set up at the target's center. A right-to-left action was automatically implemented on the camera-mounted target when the rifle was fired. That camera was never hit, not even once. Says something, eh?



These bucks were all taken in a two-hour period, at long-range, along the Missouri River bluffs. It pays to know your rifle. You can't do that without knowing your rifle and ammo.

As the Calhoon bullet was designed a good deal like the Nosler Ballistic Tip, I matched the Nosler 55-grain against it in the next run. The Nosler crossed the muzzle screen at 3,489 fps and clipped the 300-yard downrange

window at 2,481 fps. The loss rate in velocity for the Nosler was 28 percent, giving this bullet the least amount of “hang time” among all the bullets tested. What I also noticed during this testing was that, as the velocity/energy of the bullet increased, for the most part because of the increase in cartridge energy, it got much easier to hit the paired screens’ four-inch-square window, even when moved out to 400 yards. Less wind drift and less drop with a shorter “hang time” means better ballistics and more on-target hits, versus bouncing bullets off armor or missing the screens.

With a solid comfort level built around 300-yard work with the .22-250 Remington, it was time to move to the .25-caliber bullets in the .25-06 Remington. For this a Ruger M-77 MK II Target/Varmint rifle was pressed to work on the range. Loads in this test consisted of the 87-grain Berger, the 87-grain Sierra flat-base bullet, the 87-grain Speer TNT hollowpoint, and the 100-grain Speer boat-tail.

Shooting the Speer TNT and Berger custom 87-grain pills produced an even load-to-load 25-percent velocity drop at 300 yards. The Speer hit the screens with 2,431 fps retained velocity downrange, while the Berger came in at 2,503 fps. Berger’s 87-grain had been pushed a bit faster, with an average muzzle velocity of 3,349 fps, giving it a 97 fps head start over the Speer bullet. Moving to the Speer 100-grain bullets, on the other hand, clearly indicated an increase in terminal velocity loss. Now the heavy varmint bullet was coming into the screens at a 23-percent velocity loss. Hitting that 4x4 window was easy, though, as this bullet was able to fight off crosswinds and didn’t indicate much drop at all over that distance. Just seeing this reveal at the chronograph screens told me that the 100-grain Speer BT was up for some serious work on dog towns later in the year. (As

it later turned out, this bullet in the .25-06 Remington and Ruger M-77 MK II did record a 618-yard measured kill on a prairie dog.)

As a final element to the test, I moved to the 400-yard range. After resetting all the equipment on a bright Monday morning, with a clear sky and dead air, I loaded the .25-06 with a fresh, handloaded round housing an 87-grain Berger bullet. At a muzzle velocity of 3,360 fps, this pill pushed over the 400-yard screen at 2,289 fps for a retained velocity of 68 percent. Again, as in the 300-yard work, I found the heavier bullets easier to manage across drift and drop. Shooting a second run with the Sierra 87-grain bullets produced a muzzle velocity of 3,416 fps and a target velocity of 2,135 fps, for a velocity retention of 63 percent. That indicates that a bullet in .25-caliber at this grain weight will hold a bit more than 50 percent of its velocity within that 400-yard range; in other words, when shooting this combination in a .25-caliber rifle, your bullet speed is about half done at 400 yards. Turning to the 100-grain Speer boat-tail at 400 yards indicated that this bullet came over the screens at 3,320 fps and retained a full 77 percent of its downrange speed. That says you're gaining accuracy and with less drift in the big bullets, as well as an ability to better fight off updrafts, crosswinds, and the like.

The second part of this ballistic profile deals with raw drop tables, including 30 mile per hour lead and 10 mile per hour wind drift data. Using tables like these, you don't necessarily need the expensive ballistic computers so common among professional shooters and military police snipers nowadays. If this book were dealing solely with sniper tactics, then, yes, the advancement of more sophisticated equipment would be in order. But try and remember that, for the most part, hunters and even many target shooters are not going to require such advanced ranging equipment in the

field. Truly, you're better off learning your own instincts than depending on man-made tools of the trade.

Using the tables for the .300 Win. Mag., you can, for example, gain a pretty good idea of where that bullet will strike at, say, 600 yards.

Following the chart, you'll see it's a full 53.2 inches. That's roughly a yard and a half, and now those Mil Dots or hashmarks become solid gold to you as you line up behind the scope—just lift your glass to the correct mark for drop compensation and touch off the round.

VELOCITY RETENTION TEST RESULTS

CARTRIDGE	BULLET	MV (fps)	TARGET VEL (fps)	TARGET RANGE (Yds.)	% VEL. RETAINED AT TARGET
.22-250 Rem.	40-gr. Fed.	3894	2070	300	53%
.223 Rem.	40-gr. Fed	3676	2212	200	60%
.22-250 Rem.	40-gr. Nosler	3667	2162	300	59%
.22-250 Rem.	50-gr. Nosler	3700	2471	300	67%
.223 Rem.	50-gr. Speer	3171	2199	200	69%
.223 Rem.	50-gr. Speer	3251	2258	200	69%
.22-250 Rem.	51.3-gr. Calhoon	3671	2241	300	61%
.22-250 Rem.	51.3-gr. Calhoon	3582	2325	300	65%
.22-250 Rem.	Rem 52-gr. Win EXP	3652	2276	300	62%
.223 Rem.	55-gr. Berger	3139	2241	200	71%
.22-250 Rem.	55-gr. Berger	3527	2401	300	68%
.22-250 Rem.	55-gr. Fed BT	3611	2374	300	66%
.22-250 Rem.	55-gr. Hornady FM	3286	2284	300	70%
.22-250 Rem.	55-gr. Hornady SX	3353	2150	300	64%
.22-250 Rem.	55-gr. Nosler	3503	2481	300	71%
.223 Rem.	55-gr. Nosler	3170	2311	200	73%
.22-250 Rem.	55-gr. Win SP	3365	2162	300	64%
.25-06 Rem.	87-gr. Berger	3360	2289	400	68%
.25-06 Rem.	87-gr. Berger FB	3361	2503	300	74%
.25-06 Rem.	87-gr. Sierra FB	3416	2135	400	63%
.25-06 Rem.	87-gr. Sierra FB	3415	2437	300	71%
.25-06 Rem.	87-gr. Speer TNT	3263	2431	300	75%
.25-06 Rem.	100-gr. Speer BT	3330	2550	300	77%
.25-06 Rem.	100-gr. Speer BT	3320	2364	400	71%

[View a text version of this table](#)

.300 WINCHESTER MAGNUM DROP

Drag Function: G1

Standard Atmosphere: 59° F.; 29.53 inches of Mercury at Sea Level

Standard Ballistic Coefficient: 0.4470

Sight Over Bore (Inches): 1.5

Zero Range (Yards): 250

Cross-Wind (Mph): 10

Bullet-Gr.: Sierra 168.0 HPBT

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)
0	-1.5	0.0	3200	0.0000	3820.9	0.0
50	0.8	0.1	3087	0.0477	3556.8	-0.4
100	2.1	0.6	2978	0.0972	3308.6	-1.8
150	2.5	1.4	2871	0.1485	3075.2	-4.1
200	1.8	2.5	2766	0.2017	2855.7	-7.5
250	-0.0	4.0	2665	0.2570	2649.1	-12.0
300	-3.0	5.8	2565	0.3144	2454.7	-17.7
350	-7.4	8.1	2467	0.3740	2271.7	-24.8
400	-13.2	10.7	2372	0.4360	2099.5	-33.3
450	-20.5	13.8	2279	0.5005	1937.7	-43.4
500	-29.5	17.4	2188	0.5677	1785.6	-55.1
550	-40.4	21.5	2098	0.6377	1643.0	-68.6
600	-53.2	26.1	2011	0.7107	1509.5	-84.2
650	-68.1	31.2	1926	0.7869	1384.8	-101.9
700	-85.4	37.0	1844	0.8665	1268.7	-122.0
750	-105.2	43.4	1764	0.9497	1160.9	-144.8
800	-127.9	50.5	1686	1.0367	1061.1	-170.4
850	-153.6	58.2	1612	1.1277	969.2	-199.2
900	-182.6	66.7	1540	1.2229	884.8	-231.5
950	-215.3	76.0	1471	1.3226	807.9	-267.6
1000	-252.1	86.1	1407	1.4269	738.2	-307.9

[View a text version of this table](#)

.308 WINCHESTER DROP

Drag Function: G1

Standard Atmosphere: 59° F.; 29.53 inches of Mercury at Sea Level

Standard Ballistic Coefficient: 0.4470

Sight Over Bore (Inches): 1.5

Zero Range (Yards): 250

Cross-Wind (Mph): 10

Bullet-Gr.: Sierra 168.0 HPBT

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)
0	-1.5	0.0	2712	0.0000	2744.4	0.0
50	1.6	0.2	2611	0.0564	2544.4	-0.6
100	3.4	0.8	2513	0.1149	2356.1	-2.5
150	3.8	1.7	2416	01758	2178.9	-5.7

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)
200	2.7	3.1	2322	0.2391	2012.3	-10.5
250	0.0	5.0	2230	03050	1855.7	-16.8
300	-4.4	7.4	2140	0.3737	1708.7	-25.0
350	-10.8	10.2	2052	0.4453	1570.9	-35.0
400	-19.2	13.6	1966	0.5200	1442.2	-47.0
450	-29.8	17.6	1882	0.5979	1322.1	-61.4
500	-42.9	22.2	1801	0.6794	1210.4	-78.2
550	-58.7	27.5	1722	0.7646	1106.9	-97.7
600	-77.4	33.4	1646	0.8537	1011.3	-120.2
650	-99.3	40.1	1573	0.9469	923.5	-146.0
700	-124.8	47.5	1503	1.0445	843.1	-175.4
750	-154.1	55.8	1437	1.1466	770.0	-208.7
800	-187.6	64.8	1374	12534	704.1	-246.4
850	-225.7	74.8	1315	1.3651	644.9	-288.9
900	-268.8	85.5	1260	1.4817	592.5	-336.7
950	-317.4	97.2	1210	1.6032	546.4	-390.2
1000	-372.0	109.7	1165	1.7296	506.5	-449.9

[View a text version of this table](#)

.30-06 SPRINGFIELD DROP

Drag Function: G1

Standard Atmosphere: 59° F.; 29.53 Inches of Mercury at Sea Level

Standard Ballistic Coefficient: 0.3970

Sight Over Bore (Inches): 1.5

Zero Range (Yards): 250

Cross-Wind (Mph): 10

Bullet-Gr.: 150-gr. FMJBT

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)
0	-1.5	0.0	3048	0.0000	3095.1	0.0
50	1.0	0.2	2926	0.0502	2852.0	-0.5
100	2.5	0.7	2807	0.1026	2625.0	-2.0
150	2.9	1.7	2691	0.1571	2413.2	-4.6
200	2.1	3.0	2579	0.2141	2215.3	-8.4
250	0.0	4.8	2469	0.2735	2030.5	-13.5
300	-3.5	7.1	2362	0.3357	1857.9	-20.0
350	-8.6	9.9	2257	0.4006	1697.0	-28.1
400	-15.4	13.2	2155	0.4687	1547.0	-37.9
450	-24.1	17.1	2055	0.5399	1407.6	-49.6
500	-34.8	21.6	1959	0.6147	1278.3	-63.4
550	-47.8	26.7	1865	0.6932	1158.8	-79.5
600	-63.3	32.6	1774	0.7756	1048.8	-98.1

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)
650	-81.6	39.2	1687	0.8624	947.9	-119.5
700	-102.9	46.6	1603	0.9536	856.0	-144.1
750	-127.6	54.8	1523	1.0496	772.6	-172.2
800	-156.1	63.9	1447	1.1507	697.5	-204.2
850	-188.7	74.0	1376	1.2571	630.5	-240.6
900	-225.9	85.0	1309	1.3689	571.2	-281.8
950	-268.2	97.0	1249	1.4862	519.5	-328.4
1000	-316.0	110.0	1194	1.6092	475.0	-381.0

[View a text version of this table](#)

7MM REMINGTON MAGNUM DROP

Drag Function: G1

Standard Atmosphere: 59° F.; 29.53 Inches of Mercury at Sea Level

Standard Ballistic Coefficient: 0.3910

Sight Over Bore (Inches): 1.5

Zero Range (Yards): 250

Cross-Wind (Mph): 10

Bullet-Gr.: Sierra 130.0 HPBT

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)
0	-1.5	0.0	3270	0.0000	3087.4	0.0
50	0.7	0.2	3139	0.0468	2845.7	-0.4
100	2.1	0.7	3013	0.0956	2620.7	-1.7
150	2.4	1.6	2890	0.1464	2411.1	-4.0
200	1.8	2.8	2770	0.1994	2215.6	-7.3
250	-0.0	4.5	2654	0.2548	2033.3	-11.7
300	-3.0	6.6	2540	0.3126	1863.1	-17.4
350	-7.4	9.1	2430	0.3729	1704.4	-24.4
400	-13.2	12.2	2322	0.4361	1556.4	-32.9
450	-20.7	15.7	2216	0.5022	1418.5	-43.0
500	-29.9	19.9	2114	0.5715	1290.3	-54.9
550	-41.1	24.6	2014	0.6442	1171.4	-68.8
600	-54.4	29.9	1917	0.7205	1061.4	-84.8
650	-70.1	36.0	1823	0.8008	960.0	-103.3
700	-88.4	42.8	1733	0.8852	866.9	-124.4
750	-109.6	50.3	1646	0.9740	781.9	-148.6
800	-134.0	58.7	1562	1.0676	704.7	-176.1
850	-162.0	68.0	1483	1.1662	635.1	-207.3
900	-193.9	78.2	1408	1.2700	572.8	-242.7
950	-230.2	89.4	1339	1.3793	517.5	-282.8
1000	-271.4	101.5	1275	1.4941	469.1	-328.1

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)
0	-1.5	0.0	3356	0.0000	2751.6	0.0
50	0.7	0.2	3202	0.0458	2505.2	-0.4
100	2.0	0.8	3054	0.0937	2278.5	-1.6
150	2.4	1.8	2911	0.1440	2069.6	-3.8
200	1.8	3.2	2772	0.1969	1877.0	-7.0
250	0.0	5.1	2637	0.2523	1699.3	-11.4
300	-3.0	7.5	2507	0.3107	1535.3	-17.0
350	-7.4	10.4	2380	0.3721	1383.9	-23.9
400	-13.3	13.9	2257	0.4368	1244.4	-32.4
450	-21.0	18.1	2137	0.5051	1116.1	-42.7
500	-30.5	22.9	2021	0.5773	998.3	-54.9
550	-42.2	28.5	1909	0.6536	890.7	-69.2
600	-56.3	34.9	1801	0.7345	792.8	-86.0
650	-73.0	42.1	1698	0.8203	704.2	-105.5
700	-92.8	50.3	1599	0.9114	624.7	-128.2
750	-115.9	59.4	1506	1.0081	553.8	-154.5
800	-142.9	69.6	1418	1.1108	491.3	-184.8
850	-174.2	80.9	1337	1.2197	436.8	-219.7
900	-210.4	93.4	1264	1.3352	390.1	-259.9
950	-252.1	107.0	1198	1.4572	350.7	-305.9
1000	-299.8	121.7	1141	1.5856	318.3	-358.4

[View a text version of this table](#)

6MMX.284 WILDCAT DROP

Drag Function: G1

Standard Atmosphere: 59° F.; 29.53 Inches of Mercury at Sea Level

Standard Ballistic Coefficient: 0.1980

Sight Over Bore (Inches): 1.5

Zero Range (Yards): 250

Cross-Wind (Mph): 10

Bullet-Gr.: Sierra 60.0 HP

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)	30MPH-LEAD (Feet)
0	-1.5	0.0	3526	0.0000	1656.8	0.0	0.0
50	0.8	0.3	3256	0.0443	1413.0	-0.4	1.9
100	2.2	1.3	3003	0.0923	1201.7	-1.6	4.1
150	2.7	2.9	2764	0.1443	1018.0	-3.7	6.4

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)	30MPH-LEAD (Feet)
200	2.0	5.4	2537	0.2010	857.8	-7.0	8.8
250	0.0	8.8	2321	0.2628	718.1	-11.7	11.6
300	-3.6	13.2	2116	0.3305	596.8	-18.0	14.5
350	-9.2	18.8	1922	0.4048	492.2	-26.2	17.8
400	-17.2	25.8	1739	0.4869	403.1	-36.9	21.4
450	-28.0	34.3	1570	0.5777	328.6	-50.6	25.4
500	-42.3	44.5	1417	0.6783	267.7	-68.1	29.8
550	-61.0	56.6	1284	0.7896	219.6	-90.2	34.7
600	-85.0	70.7	1173	0.9120	183.4	-118.0	40.1
650	-115.3	86.6	1087	1.0451	157.6	-152.6	46.0
700	-153.0	104.2	1023	1.1875	139.4	-194.7	52.3
750	-198.9	123.2	972	1.3382	125.8	-244.8	58.9
800	-254.0	143.5	929	1.4962	115.1	-303.6	65.8
850	-319.3	165.1	892	1.6611	106.1	-371.6	73.1
900	-395.4	187.8	859	1.8326	98.4	-449.3	80.6
950	-483.4	211.6	829	2.0106	91.6	-537.6	88.5
1000	-584.0	236.6	801	2.1951	85.5	-637.2	96.6

[View a text version of this table](#)

.25X.284 WILDCAT DROP

Drag Function: G1

Standard Atmosphere: 59° F.; 29.53 Inches of Mercury at Sea Level

Standard Ballistic Coefficient: 0.2830

Sight Over Bore (Inches): 1.5

Zero Range (Yards): 250

Cross-Wind (Mph): 10

Bullet-Gr.: Sierra 87.0 SPT

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)
0	-1.5	0.0	3347	0.0000	2164.6	0.0
50	0.8	0.2	3164	0.0461	1934.8	-0.4
100	2.2	0.9	2989	0.0949	1726.7	-1.7
150	2.6	2.1	2821	0.1465	1537.9	-3.9
200	1.9	3.9	2659	0.2013	1366.5	-7.3
250	-0.0	6.2	2503	0.2594	1210.6	-11.8
300	-3.3	9.2	2352	0.3213	1069.1	-17.8
350	-8.2	12.9	2206	0.3871	940.8	-25.3

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)
400	-14.8	17.4	2066	0.4574	824.7	-34.7
450	-23.5	22.7	1931	0.5325	720.3	-46.1
500	-34.5	29.0	1801	0.6129	626.9	-59.9
550	-48.2	36.3	1678	0.6992	544.1	-76.5
600	-65.0	44.7	1562	0.7919	471.4	-96.3
650	-85.4	54.4	1454	0.8915	408.3	-119.8
700	-109.9	65.3	1354	0.9984	354.5	-147.8
750	-139.1	77.6	1265	1.1130	309.5	-180.8
800	-173.8	91.2	1188	1.2355	272.7	-219.6
850	-214.6	106.2	1123	1.3655	243.7	-265.1
900	-262.3	122.5	1070	1.5025	221.1	-317.7
950	-317.6	139.8	1026	1.6459	203.3	-378.0
1000	-381.2	158.2	989	1.7950	188.9	-446.4

[View a text version of this table](#)

.220 SWIFT DROP

Drag Function: G1

Standard Atmosphere: 59° F.; 29.53 Inches of Mercury at Sea Level

Standard Ballistic Coefficient: 0.2350

Sight Over Bore (Inches): 1.5

Zero Range (Yards): 250

Cross-Wind (Mph): 10

Bullet-Gr.: Hornady 55.0 HP

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)	30MPH-LEAD (Feet)
0	-1.5	0.0	3580	0.0000	1565.6	0.0	0.0
50	0.2	0.3	3349	0.0433	1369.8	-0.4	1.9
100	1.0	1.0	3130	0.0897	1196.4	-1.5	3.9
150	1.0	2.4	2921	0.1393	1042.5	-3.5	6.1
200	0.0	4.4	2723	0.1925	905.5	-6.5	8.5
250	-2.2	7.1	2533	0.2496	783.5	-10.8	11.0
300	-5.8	10.5	2350	0.3111	674.8	-16.3	13.7
350	-10.9	14.8	2176	0.3774	578.2	-23.5	16.6
400	-17.9	20.1	2008	0.4492	492.7	-32.5	19.8
450	-27.0	26.4	1849	0.5270	417.6	-43.8	23.2
500	-38.7	33.9	1699	0.6117	352.4	-57.7	26.9
550	-53.4	42.8	1558	0.7039	296.6	-74.8	31.0
600	-71.7	53.1	1429	0.8045	249.5	-95.6	35.4

[View a text version of this table](#)

.22-250 REMINGTON DROP

Drag Function: G1

Standard Atmosphere: 59° F.; 29.53 Inches of Mercury at Sea Level

Standard Ballistic Coefficient: 0.2470

Sight Over Bore (Inches): 1.5

Zero Range (Yards): 250

Cross-Wind (Mph): 10

Bullet-Gr.: Hornady 52.0 A-Max

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)
0	-1.5	0.0	3630	0.0000	1521.9	0.0
50	0.1	0.2	3407	0.0427	1340.6	-0.3
100	1.0	1.0	3195	0.0881	1179.2	-1.4
150	1.0	2.2	2994	0.1366	1035.3	-3.4
200	-0.0	4.1	2802	0.1884	906.5	-6.3
250	-2.1	6.5	2617	0.2438	791.2	-10.3
300	-5.4	9.7	2441	0.3032	687.9	-15.6
350	-10.2	13.7	2271	0.3669	595.4	-22.4
400	-16.7	18.5	2107	0.4355	512.9	-30.9
450	-25.2	24.2	1951	0.5094	439.6	-41.4
500	-35.9	31.0	1802	0.5895	375.1	-54.2
550	-49.4	39.0	1661	0.6762	318.8	-69.9
600	-65.9	48.3	1530	0.7703	270.5	-88.8

[View a text version of this table](#)

.223 REMINGTON DROP

Drag Function: G1

Standard Atmosphere: 59° F.; 29.53 Inches of Mercury at Sea Level

Standard Ballistic Coefficient: 02230

Sight Over Bore (Inches): 1.5

Zero Range (Yards): 250

Cross-Wind (Mph): 10

Bullet-Gr.: Speer 50.0 TNT-HP

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)
0	-1.5	0.0	3242	0.0000	1167.2	0.0
50	0.5	0.3	3017	0.0480	1010.9	-0.4
100	1.5	1.2	2803	0.0995	872.8	-1.8
150	1.4	2.9	2600	0.1551	750.6	-4.3
200	-0.0	5.3	2405	0.2151	642.3	-8.1
250	-2.9	8.6	2219	0.2800	546.7	-13.4
300	-7.5	12.8	2041	0.3505	462.4	-20.5
350	-14.3	18.2	1871	0.4273	388.9	-29.7
400	-23.5	24.8	1712	0.5111	325.3	-41.4
450	-35.8	32.8	1563	0.6029	271.3	-56.3
500	-51.5	42.4	1427	0.7034	226.1	-74.8
550	-71.6	53.6	1306	0.8133	189.4	-98.0
600	-96.8	66.5	1203	0.9331	160.6	-126.5

[View a text version of this table](#)

.223 WSSM DROP

Drag Function: G1

Standard Atmosphere: 59° F.; 29.53 Inches of Mercury at Sea Level

Standard Ballistic Coefficient: 02550

Sight Over Bore (Inches): 1.5

Zero Range (Yards): 250

Cross-Wind (Mph): 10

Bullet-Gr.: Sierra 55.0 BlitzKing

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)
0	-1.5	0.0	3703	0.0000	1675.0	0.0
50	0.0	0.2	3483	0.0418	1481.9	-0.3
100	0.9	0.9	3274	0.0862	1309.5	-1.4
150	0.9	2.1	3075	0.1335	1155.3	-3.2
200	-0.0	3.8	2885	0.1838	1017.0	-6.0
250	-1.9	6.2	2703	0.2375	892.8	-9.8
300	-5.1	9.1	2529	0.2949	781.2	-14.9
350	-9.6	12.8	2361	0.3563	680.8	-21.2
400	-15.6	17.3	2199	0.4221	590.7	-29.2
450	-23.5	22.6	2044	0.4929	510.1	-39.0
500	-33.4	28.9	1895	0.5691	438.6	-51.0
550	-45.8	36.2	1753	0.6514	375.6	-65.4
600	-61.0	44.8	1620	0.7405	320.6	-82.8

[View a text version of this table](#)

.243 WSSM DROP

Drag Function: G1

Standard Atmosphere: 59° F.; 29.53 Inches of Mercury at Sea Level

Standard Ballistic Coefficient: 0.3300

Sight Over Bore (Inches): 1.5

Zero Range (Yards): 250

Cross-Wind (Mph): 10

Bullet-Gr.: Hornady 75.0 V-Max

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)
0	-1.5	0.0	3550	0.0000	2099.3	0.0
50	0.5	0.2	3385	0.0433	1908.8	-0.4
100	1.7	0.7	3227	0.0887	1734.2	-1.5
150	2.1	1.7	3074	0.1363	1573.9	-3.4
200	1.6	3.0	2926	0.1863	1426.5	-6.3
250	-0.0	4.9	2784	0.2389	1290.9	-10.2
300	-2.7	7.1	2646	0.2941	1166.1	-15.2
350	-6.6	10.0	2512	0.3523	1051.1	-21.4
400	-11.9	13.3	2382	0.4136	945.1	-29.1
450	-18.7	17.3	2256	0.4784	847.7	-38.3

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)
500	-27.2	21.9	2133	0.5467	758.2	-49.2
550	-37.7	27.2	2015	0.6191	676.3	-62.0
600	-50.3	33.2	1900	0.6957	601.6	-77.1
650	-65.3	40.1	1790	0.7771	533.8	-94.6
700	-83.0	47.9	1685	0.8635	472.7	-115.0
750	-103.8	56.6	1584	0.9553	418.1	-138.5
800	-128.0	66.3	1489	1.0530	369.6	-165.8

[View a text version of this table](#)

.300 WSM REMINGTON DROP

Drag Function: G1

Standard Atmosphere: 59° F.; 29.53 Inches of Mercury at Sea Level

Standard Ballistic Coefficient: 0.4470

Sight Over Bore (Inches): 1.5

Zero Range (Yards): 250

Cross-Wind (Mph): 10

Bullet-Gr.: Sierra 168.0 HPBT

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)
0	-1.5	0.0	2991	0.0000	3338.1	0.0
50	1.1	0.2	2884	0.0511	3103.0	-0.5
100	2.6	0.7	2779	0.1041	2881.8	-2.0
150	3.0	1.5	2677	0.1591	2673.7	-4.7
200	2.1	2.7	2577	0.2162	2477.8	-8.6
250	0.0	4.4	2479	0.2755	2293.5	-13.8
300	-3.5	6.4	2384	0.3372	2120.0	-20.4
350	-8.6	8.9	2290	0.4014	1956.9	-28.5
400	-15.4	11.8	2199	0.4683	1803.7	-38.3
450	-23.9	15.2	2109	0.5379	1659.9	-49.9
500	-34.4	19.2	2022	0.6106	1525.3	-63.5
550	-47.0	23.7	1937	0.6864	1399.6	-79.2
600	-61.9	28.8	1854	0.7655	1282.5	-97.3
650	-79.4	34.6	1774	0.8483	1173.6	-117.9
700	-99.6	41.0	1696	0.9348	1072.9	-141.4
750	-122.9	48.1	1621	1.0253	980.0	-167.9
800	-149.4	55.9	1549	1.1200	894.8	-197.9
850	-179.6	64.5	1480	1.2191	817.0	-231.7
900	-213.8	73.9	1414	1.3228	746.4	-269.6
950	-252.3	84.2	1353	1.4313	682.8	-312.1
1000	-295.5	95.3	1295	1.5447	626.0	-359.6

[View a text version of this table](#)

.204 RUGER DROP

Drag Function: G1

Standard Atmosphere: 59° F.; 29.53 Inches of Mercury at Sea Level

Standard Ballistic Coefficient: 0.2750

Sight Over Bore (Inches): 1.5

Zero Range (Yards): 250

Cross-Wind (Mph): 10

Bullet-Gr.: Hornady 40.0 V-Max

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)
0	-1.5	0.0	3601	0.0000	1152.0	0.0
50	0.1	0.2	3401	0.0429	1027.9	-0.3
100	0.9	0.9	3211	0.0883	916.1	-1.4
150	0.9	2.0	3029	0.1364	815.2	-3.4
200	0.0	3.7	2855	0.1874	724.0	-6.3
250	-2.0	5.9	2687	0.2415	641.4	-10.2
300	-5.2	8.7	2525	0.2991	566.5	-15.4
350	-9.8	12.1	2369	0.3604	498.7	-22.0
400	-15.9	16.3	2219	0.4259	437.4	-30.1
450	-23.8	21.3	2074	0.4958	382.1	-39.9
500	-33.8	27.1	1934	0.5707	332.4	-51.9

[View a text version of this table](#)

.223 WSSM 55-GRAIN HORNADY V-MAX

CONDENSED DROP TABLE

RANGE (Yards)	VEL (fps)	ENERGY (ft-lbs)	IMPACT INCHES (250-Yd. Zero)
0	3600	1583	-1.5
50	3412	1422	0.5
100	3232	1276	1.7
150	3060	1143	2.1
200	2894	1023	1.6
250	2735	913	0.0
300	2581	813	-2.7
350	2432	722	-6.5
400	2288	639	-12.3

[View a text version of this table](#)

.204 RUGER HORNADY 45-GRAIN DROP

MV: 3626 fps

RANGE (Yards)	Bullet Impact at 200 Yards
100	+1.0
200	0.0
300	-6.5
400	-16.9
500	-36.3

CHAPTER 12

PROPS & TECHNIQUES



The author zeroing a Model 70 .223 WSSM with shooting bags on a bench. This is a simple and accurate method to use when benchrest shooting.

LONG-RANGE SHOOTING IS NOT at all about pulling up to a shooting location and merely taking your shot. Seldom, if ever, are you going to hit much that way, I don't care how instinctive a shooter you are or how good you are off-hand. It just doesn't work that way.

The game of long-range accuracy is one that requires techniques and tools that take the shake out of your sight picture. I remember I was once instructed by an old-time hunter in Minnesota, who told me that, if I had to take an offhand shot, I should rotate the sight (via my swing) in a tight

circle until, as the crosshair hit the “bottom” of the circle, touch off the shot. That works for shots inside, say, 100 yards, when using iron sights or low-power glass, but, when we stretch the bullet a bit, that method gets a bit crazy.

About the easiest way to steady a rifle is to use locally found objects or landscape items. Tree trunks, windfalls, rocks, and even mounds of earth can act as rests to stabilize your rifle for the shot. I have used everything from a corn harvester cab to an old hay rake on a field edge when selecting a good rest for a shot. These are things you don’t have to haul into the field, rather they are just there for the general use of the riflemen. The lesson here is never to pass up the obvious, when searching out a shooting rest.

I once shot a mule deer buck way down below me, at a distance of 400 yards on a snow-covered flat in the Big Horn Mountains, using the root of a juniper bush and my cowboy hat. The hat rested over the root and the rifle’s fore-end creased the hat, which produced quite a solid rest, when I finally settled in to shoot over the rim of that deep draw from the prone position.



Ross Metzger of SHOTdata Systems, of New Brighton, Minnesota, with his personally designed field shooting bench. Lightweight and low-cost, this is a dog gunner's winner.

When I fired my pre-1964 Winchester Model 70 .30-06, the muzzle flash turned my Leupold 3-9x Gold Ring blood red for a second. When everything had settled down and I could see through the scope again, I was stunned to see the deer just standing there, but then, as I jacked a second round into the chamber, it simply fell over stone dead in my sights. The measured range turned out to be 424 yards. When shooting a great cartridge but through a very light, pencil-piped, mountain-weight rifle, I regard a shot like that as one for my personal ranging data notebook. I give much credit to my improvised rest for its success.

STICKS AND BIPODS

Located on the driver's side bed of my pickup truck is always a set of commercially made shooting sticks. Shooting sticks are the tool that saves the day almost every time for me, yet they never get the attention they

deserve here in the States; Africa is where you see them most, though at least more and more shooters of Western game are learning to take to them.

Today, like every day, I walk vast ridgelines out on the prairie or cut across canyons and draws, always with those sticks in one hand or hanging from my belt, when they're of a folding design. The basic shooting stick is as simple as field dirt. Many hunters with a flare for style make up their own sticks, using detailed measurements to fit their body size and gun. Some shooting sticks are made up of a heavy shaft of arrow fiberglass, complete with archery field points installed on the bottom ends and rubber caps on the rest end to keep the fore-end of the rifle cradled and unmarred. Other hunters tend to like a single pole, those monopods that also acts as a walking stick. They can help, in some instances, if you're practiced with them, but I shy away from these when long-range shots are the choice of the day. The single pole is just not solid enough, when targets get to be beyond 300 yards.



John Anderson of *Varmint Hunters Magazine* uses a tree limb for a rest.



This coyote hunter is working with commercial shooting sticks. These are inexpensive, effective, and used by most song dog hunters today.

One of the best ways to use sticks is to position yourself against a tree or even a fence post, so that you're making a triangular support platform that distributes your body mass over an even area. If nothing is available, another thing you can try is just pushing your right leg back a bit and building a wide base in conjunction with the positioned shooting sticks. Anything you can do to reduce movement is well advised here, and that's really the point. Remember, a slight twitch of the muzzle translates to your bullet being many *feet* off target at 300 yards and beyond.

A second device that helps steady your shooting, and one that is always carried on the rifle, is a steel or plastic bipod. There are a number of manufacturers offering these tools. Some builders of custom rifles, such as the .50 BMG Viper or the current military auto-loading .50-caliber by

Barrett, actually design the bipod as part of the gun itself. Harris is probably the best well-known manufacturer of bipods and currently the top choice on nearly a dozen of my rifles. This company offers a dozen different bipods and a host of adaptors for both Picatinny rail mounts and sling swivel mounts. On the short end and intended for the prone position are models with leg extensions that adjust from six to nine inches. Medium height designs have legs adjustable from nine to 13 inches, and there are two tall models for use in sitting, kneeling, and some standing positions, one with legs adjustable from 12 to 25 inches, another with legs adjustable from 13½ inches to 27 inches in height. All are mounted to the fore-end of the rifle directly on the sling stud or a Picatinny-type rail, so no drilling into the stock is necessary. These bipods also use a quick-release feature for easy on/off, and now there's a base design that Harris calls the Rotapod, where the base actually allows you to swivel the gun without relocating the bipod's legs.



Dog hunters in the prone position using Harris bipods, while shooting prairie dogs at long range.

When shooting my Tikka T-3 Tactical, a dedicated sniper rifle, I alternate between my standard one-piece shooting sticks (from a company called Sniper Styx), and the Harris. Why would I want two bipods? Because each is set at a slightly different height. This past year, while hunting coyotes, I gunned a field-sniffing song dog at 375 yards, using the Harris bipod, because my old Predator Sniper Styx (the company seems to be out of business), were just a bit too tall for a comfortable shooting position—and a comfortable shooting position is *paramount* to consistent shooting, especially at long range (i.e., if you're contorting your body to adjust to your gun or twisting to keep a rock from punching into your rib cage while shooting prone, anything like that, you're ruining your natural alignment with the gun, and that wrecks all sorts of havoc with your shooting). I was

sitting along a fence, almost in a hole, and the Harris steel sticks were the clear ticket.

SHOOTING BAGS

Shooting from bags is commonplace for nearly all prone shooting in the field, as it is when using auto window frames, hoods, ATV seats, and pickup tailgates, for western long-range hunters rolling through varmint country.

I think it is safe to say that the shooting bag, be it a commercial type or homemade, is about as simple as it gets for a rifle rest. I use the Bulls Bag (www.bullsbag.com) as a window rest in my truck cab, as my state will allow hunters to shoot from a vehicle if the target is a varmint. Heavyweight shooting bags positioned over the tailgate or from the prone position include the Caldwell bag by Battenfeld Technologies (www.caldwellshooting.com), and those made by Dog-Gone-Good (www.dog-gone-good.com). I have even used bags in combination with a benchrest-quality fore-end rest that's fully adjustable for elevation and windage. Adding the soft bag keeps any element of movement or creep of the gun across the rest's surface out of the equation, when I'm checking for group accuracy after handloading a new load.



The author prepares to go to work on a distant dog town shooting off a Caldwell bag rest.

For use in the field, I fill my shooting bags with cornmeal or oats, to reduce their weight. Sand, of course, is a traditional filler, but, because it's heavy, I reserve its use for bags used at the rifle range on a benchrest table. Weight is always a consideration in the field; carrying around seven pounds of sand all day is exhausting. That exhaustion, of course, can certainly affect your shooting through muscle fatigue, poor breathing, etc. End of story, whether you're mobile via a truck or ATV or you have the opportunity to setup a light benchrest to shoot over a prairie dog town for the day, the use of a shooting bag can help reduce many accuracy problems.

SHOOTING TABLES

Assigned to the heavy rifle rest category are those shooting tables designed to be used out in the hunting field where vehicles are permitted. They are usually off-loaded from a truck or trailer bed driven to the shooting site. Sometimes these tables are left on the truck and the shooter just sits atop the truck bed at the table and fires away when the vehicle is stopped—sure saves the hassle of unloading and unloading, when the towns are small and targets few.

About the grandest system I ever was a part of was during a hunt with Beretta near Elk Mountain, Wyoming. We were hunting prairie dogs and coyotes on this outing. It was during the dog hunting part of this event that we were all piled into a large, road service bus. This outfit carried 25 people with ease and retained a full kitchen and lounge. On the underside of the rig were packed two large shooting tables, bags, and benchrest shooting setups.

Reaching the hunt area, which was close to a main road for obvious reasons, the bus was unloaded and the generators started for the air conditioning (yeah, it was pretty swanky!). Then those big shooting tables that hosted three shooters at a time were set up in the shade of the big bus. It was a crazy deal, but there were prairie dogs to shoot and we were in total comfort.



Case-Gard table and adjustable MTM benchrest shooting station. This system is accurate when zeroing a rifle, but not the best in the field.

Two of the products put into use for this shoot were the Steady Rest made by Caldwell and a similar rest made by MTM Case-Gard. Both have become quite popular among prairie dog shooters employing these kinds of in-the-field bench setups. The Case-Gard MTM rest I was using sets on a Case-Gard shooting table and allows full adjustments for elevation, windage, and rifle attitude. These rest designs are almost always one-piece and made of lightweight material, but, when set on a solid platform, they offer enough strength to keep a rifle solid and aid in gaining accurate groups.

Working from a shooting table, just about any type of rest can be used. My Case-Gard shooting table is made of ultra lightweight aluminum and heavy plastic, yet it retains a total carry weight of six pounds. No, that six

pounds is not an error, and that makes this rock-solid bench very portable. As a seat for that light table, I have turned to Beretta and a backpack it used to make that includes a seat, all in one portable package. I carry water, ammo, and a GPS in this bag, along with a snake kit, handgun, and extra ammo. Set the table up, drop the pack, swing the seat open, and I'm in business at less than nine pounds of carry weight.

Shooting tables come in many different forms. Some are just big, heavy, bench-type tables, while others are fancy pivoting arms that allow the shooter to rotate 360 degrees without leaving the rifle sights, kind of like using a B-17 ball turret on the ground. It seems as though every time I turn around, someone is building a newer and more advanced shooting table. Most of them that I have used are great, but, again, you need to get them to the shooting location. If you've got to carry it any distance, much of what's of this kind of equipment just isn't practical. If, on the other hand, you have hunting lands where you can drive right up to where you need to shoot, it's not a far-fetched idea for you and a group of friends who regularly hunt together to load up a trailer with as many benches and chairs as you need and have at it. It's not much different than the gap between the puddle duck jump shooter who carries nothing more than a pocket full of shells and his gun, and the guys who set out a couple thousand decoys to tackle snow goose season. Minimal to full-bore.



The author's Remington Model 700 .25-06 in a Custom Innovations bamboo stock will fight wind far better than light .224-caliber bullets and cartridges.

Another unit I have on my range at home, one I have also taken afield from time to time, is a Shooter's Ridge product. It's a nice, solid-steel combination shooting table and seat. The newest version of this bench runs about \$165 on www.midwayusa.com. None of my tables cost me an arm and a leg, and I generally find they all get the job done; I test several hundred loads each year for both shotgun and high-power rifle using them.

A final word of caution here is in order. Some benchrest designs out there are so massively over-designed that you're no longer the shooter at all. I reviewed a setup about a year ago that was so full of bells and whistles that all I had to do was reach over and touch off the trigger to make the shot. That may sound like nirvana to some, but, when working with a rest, you need to ask yourself this question: Am I trying to aid my natural abilities in

becoming a better shot, or am I trying to turn my shooting into a mechanical event? If it's the latter, what are you going to do when such support isn't available? Even more, when it is, you then have to ask yourself, did you make the shot or did the equipment? I don't know about you, but, to my way of thinking, it's me making the shot that counts.

CROSSWIND SHOOTING

All this talk about shooting sticks and bipods and shooting benches is great, but the thing to remember is that they're for use outside. You know what's outside? Wind.

Now that we have the rifle tied down by way of some type of rest, the next element facing long-range shooters is the air. Wind is the killer of many a good long-range shot, but it can be dealt with if approached in a logical and straightforward manner. Here I will turn to the lessons learned in the World Wars, as well as with our current Middle Eastern military units employed as trained snipers. These guys *have* to make the shot. Otherwise they get killed. Don't think for a minute that all their shooting is on a dead-calm morning, because nothing could be further from the truth. Snipers learn quickly how to dope the wind, and despite all the schools, despite all the books, and despite all the advertisements, it's not done using fancy wind measuring equipment. Really, mastering the wind is mostly about common sense.



Shooter Tom Hansen and his spotter Kevin Janish are shooting with a strong 20 mph crosswind. This is over the limit, but, by pulling in the range, the .223 Rem. can still stay in the game.

Learning the wind is the easy part. If the wind is less than three miles per hour, you most likely won't feel it at all. Just above that speed, you will feel it on your face and smoke will drift slowly away. When the wind speed is above five miles per hour, smoke or dust will drift faster and be more readily apparent. From five to eight miles per hour, the leaves on trees begin to move. When the wind builds to 12 miles per hour, the tops of small trees will be moving. Buck it to 15, and large trees will start to sway. I'm sure our snipers in Iraq need to use some other indicators when judging wind on a treeless, sand-covered surface, but judge they do, because that is a major part of their field craft.

Even if you have determined wind speed as it exists at the point you're shooting from, everything can and will change several hundred yards downrange to where your target sits. All of this is not to mention the fact that wind tends to switch, thermals cause updrafts or downdrafts, and, at times, the wind simply goes dead, any and all of this across the span that is the distance between your rifle's muzzle and your bullet's intended target.

All that in-between air movement is sign that needs to be read using your spotting scope, field binocular, and even your rifle scope in the moments before you pull the trigger. Observe the grass near a target. If there is water nearby, check the direction of wave action and size. Small ripples moving right to left will indicate a soft wind of under seven miles per hour, but waves that roll off themselves will mean winds of 12 miles per hour or more. In South Dakota, we have numerous stock tanks that are filled with water. These small pond areas always have coyotes, jacks, prairie dogs, or game critters such as pronghorn hanging around them—and I *always* watch the water when I hunt over these magnet locations. It is one small example of working with exactly what you have to work with. (A news flash here: there aren't many trees on the prairies of western South Dakota!)

Another rule to follow is that, by working with a bigger cartridge and more bullet weight, you'll help fight off the effects of wind on a bullet. Wait. Stop. I want to make it very clear that in no way will you ever find a bullet and cartridge that are not affected by the wind on some level. That's just not going to happen, but bigger and better can mean *less* drift off target. On prairie dogs, I like to work with a bit more rifle than some, because it keeps me in the game longer as the day's heat builds and those natural windmills in the atmosphere start up. A dead calm morning can end up building to a raging 25 mile per hour wind by high noon on the open prairie. Shooting say a 75-grain 6mm (.243) will cut a lot of bullet drift

versus shooting a 55-grain .223-caliber rifle. (Note and study the long-range rifle ballistic tables covered elsewhere in this book.)

Another example. The powerful .300 Win. Mag. shooting its time-honored 168-grain boat-tail will drift off target a full 10.7 inches at 400 yards with just a 10 mile per hour wind across the bullet's path. Drop the bullet weight to 130 grains, as in Sierra's HPBT in a 7mm Rem. Mag., and the 400-yard drift for that bullet is 12.2 inches. At 2,322 fps in the 7mm versus 2,372 in the .30-caliber .300 Win. Mag., the 7mm bullet's lighter weight, with almost the same velocity at 400 yards as the .30-caliber, is simply more affected by wind. Both require some serious Kentucky windage to make the shot, but why make it harder than it has to be? In this business, even small differences mean a whole lot, and good riflemen don't assume anything.

Now here's where some of that common sense I talked about comes in. When hunting an area, read the wind and try to use it to your *advantage*. Instead of shooting perpendicular to the wind, try and maneuver around so that wind is at your back. You can eliminate the wind as a problem if it is a tailwind. Almost the same goes for headwinds, but I have shot into gusty headwinds that I believe caused my bullet to drop more than normal. Yes, I know it's not always possible to maneuver your shooting position, but that doesn't mean you shouldn't try when you can.



Shooting in wind requires some knowledge about a bullet's reaction to a crossing wind. Lacking that information, you will miss every time.

Using the terrain can help you deal with wind. For instance, shooting a deep draw so that you're out of the wind can be a way to spend a day on a prairie dog town or around marmot rock ledges. I hunted just this way in Idaho, several years ago, shooting .22-250 Browning low wall rifles and Winchester/Nosler BST ammo. The 55-grain pills just couldn't get to where they were going along the ridgeline, as the winds blew briskly across there.

Deep in a large rock canyon, however, we had it made, and the light rifles with those small, fast bullets did a fine job well out to 450 yards or more.

If you can pick your shooting times, always try to shoot early in the morning and late in the day. Both times tend to develop less wind and, at times, you can even enjoy some dead-calm conditions. I have shot my very best long-range targets at dawn on summer mornings with the dead still air that so often accompanies them. I use a match to test for wind, and when that burning carbon from the match head goes straight up, it's time for long-range shooting!



7.62X51 MATCH Ammunition. Quality ammo makes for a good start toward accuracy.

I had a buddy years ago, Greg Hendricks, who shot a custom-built .223 Remington on prairie dogs. He shot many a morning off sticks and killed 600-yard dogs regularly with that setup. He knew his rifle, and he also knew that the .224-caliber 55-grain pill could not fight off much wind in its

travels. His system worked, because he had taken the time to know his craft well. Just how good was Greg? Taking his M1 National Match Garand to an NRA Nationals competition, Greg, with his wife as a spotter, shot the M1 Garand 1,000-yard open sight competition against all comers, including military snipers, and won his event. (As a side note here, the 7mm Remington Magnum in the Ruger No. 1 that I shoot today for long-range work was one of Greg's rifles. He had bought two of them as a matching pair. He believed in the "big seven" as a long-poke killer, as do I.)

OTHER BOGEYMEN ON THE LINE

Bullets hitting high when shooting uphill or downhill are problems to deal with in the field. When you're in mountain country, fighting winds is one thing, but you also need to compensate for vertical angles. How much compensation? According to the *Vihtavuori First Edition Reloading Manual*, with an elevation angle of minus/plus 30 degrees, the increase in bullet path/height will be $0.134 \times d$ ("d" being the symbol for bullet drop, that number part of your ballistics charts for your cartridge). When that angle is increased to minus/plus 40 degrees, the bullet drop will increase to $0.234 \times d$. While this may not seem like much, I have missed at long range because of this "math."

Other elements can come into play as well, though these are more subtle than the others. The Magnus effect, being the amount of resistance on one side of the bullet or the other as it rotates through the air, can cause it to move right or left. The Poisson effect, being the bed of air under a bullet in flight, can change as the bullet loses velocity, causing that bullet to move off its trajectory. However, to take all this in as you trip a couple of pounds off the trigger is just too much to handle. It's important to those in competition, and, no, it never hurts to expand your education to these

lengths. But, in the everyday practical world of the hunter and weekend shooter, you're better off learning solid field craft and practice shooting at long range as much as possible—and then have the wisdom to pass up shots you're not confident in making.



Taking a bull elk at long range while on the move means knowing your rifle well.

BEYOND BREATHING AND TRIGGER CONTROL

Regardless how much equipment you own—ranging units, benchrest tables, spotting scopes, and high-grade sights and rifles—your shooting accuracy won't be much unless you take the time to practice. For the most part, you can leave home about half the stuff some guys pack, if you have mastered the art of understanding your rifle's accuracy and range limits.

This comes about when you put in time on the trigger. Nothing can replace good old hard work in this area.

I'm not saying that good equipment won't help. We all know that accurate barrels, triggers that are smooth, and good optics can make a good shooter better. Lacking basic training, though, none of those things will help a bit. Where, then, do you start when getting trained as a long-range rifle shot?

The first thing you need to do is find a place where you can send bullets safely at reasonably long distances. A quality rifle club is one place to begin, but try to locate one that retains at least a 400-yard range and preferably longer. I belong to a rifle club in Lead, South Dakota, that has only a 300-yard range, but it is good enough to zero and practice trigger control, as I break in a new rifle. When the time comes to let out the horses, I can head for the wide-open lands of the western plains; I realize that I'm very lucky to have those kinds of lands available to me.

If you're going to shoot the heavy rifles, such as the .50 BMG, .416 Barrett, .338 Lapua, and even the .300 Win. Mag., you want a 600- to 1000-yard range. These heavy horsepower cannons, and I have not named them all, need room to burn. At one point, I belonged to a rifle club in the Twin City metro area of Minnesota, that actually retained full-blown computerized targets at ultra long ranges (800 to 1,000 yards). This range was outstanding in that all you needed to do was check the target illustrated on the overhead screen as you shot, to see your impact points recorded in electronic ink. On a different range that was also set up for 1,000-yard shooting, you needed to drive down and set targets when shooting alone. With a buddy helping out, our two-way radios were put to good use, as the 1,000-yard target backers were built along a well-fortified and deep trench that housed mechanical target pullers. The range was set up this way so that

it could host competitive match shooting, but these kinds of ranges are exactly on every other block.



This gang of dog shooters has about everything you could ask for in long-range equipment and gear. Yet lacking good marksmanship skills, it is all worthless equipment in the field.

Some of the very best training I ever undertook was done during my early years as a long-range shooter. Back in the late 1950s, the land was far more open, even in the Midwestern states, and farmers welcomed varmint hunter, when it came time to clean out unwanted trash birds or rodents. I would wander miles of open meadows in search of targets, using a day pack as a rest and shooting one of my home-built .30-06 target rifles. A bit later in the game, the new-old wildcat, the commercial .22-250 Remington, in a very nice long-barreled Model 700 BDL, got the call more often than not.

That Remington was the first commercial varmint rifle I ever owned, and, as most of us have said at one point or another, I wish I had never sold it.

Okay, so what if you can't find accessible open country or a suitable club range within a reasonable drive? By stepping down in cartridge size, you can get by with less shooting distance; the .223 Rem. or even the .22-250 Rem. are in a class that can be worked through to 500 yards without sacrificing good training habits. Besides, for the most part, if you can hit at 400 to 500 yards, you're in the game at 1,000 yards after the bullet drop and wind drift have been doped out. Trigger control is the key here, as even a minor twitch or tug on the trigger can pull a long-range bullet off target by several yards. As a counterpoint, when shooting at 100 yards, you need to hold groups inside MOA, inside an inch. Anything wider and groups will open fast, when you're pushing bullets past 400 or more yards. I even favor shooting a target-grade .22 Long Rifle for basic trigger control training. With such a gun, you can shoot close-range at 100 yards or less, and the cost of a day's training is a walk in the park.

SHOOTING FROM THE GUT

I was reading someplace a while back where a young sniper was starting his training and had hauled into the field all the bells and whistles he could stuff in his backpack. Upon linking up with his instructor, he was unburdened by most of the stuff as the instructor removed everything from his pack save for ammo, water, a few energy bars, and his field glass. The student's reaction to all this was complete bewilderment, but the instructor simply told him that none of that junk was necessary.

That statement by the shooting instructor about sums up the whole idea of accurate shooting in a tight bundle. Yes, the neat ranging equipment is nice and very useful at times. Wind indicators and tables are a big help,

when you have time to figure the angle and shot on a slide rule system, and the ballistics computer is a great tool, when you have the time to punch in the data. For the most part, though, the real world will not give you that kind of time in the field. There, things move and critters don't follow rules, so sticking to the basics and learning to shoot from your gut is a cardinal rule that will win the day.

Several times over the years I have been asked to help work through new guns and loads on special culling hunts for whitetail deer. To cull deer is to thin out the herd a bit by taking out the bucks displaying poor genetics and that are specifically listed for removal by game keepers, and also reduce the general doe population where very high-grade trophy whitetails are being cultivated. For the most part, I have never had much interest in this work, with the exception of the fact that I do get to learn about bullet behavior and rifle and optic accuracy, and I get time over the rifle for some long-range work. Not a bad deal at all, seeing as how it produces enough venison to feed an entire local town. (All deer are processed and given to food pantries.)

Shooting during these hunts can be difficult. Several years ago, while testing a new bullet for Federal Cartridge on a shooting preserve down south, I culled whitetails using cue cards distributed by the ballistics engineers running the bullet tests. In effect, we had to drop the animal at a very exact range, and the bullet had to strike the animal at a specified angle. These tests were necessary, so as to bring out a humane bullet versus one that wounded. The problem with this kind of very precise shooting was the time available on target—there just wasn't a lot of it. I found myself going back to the basics. We had a high tower stand setup, and all that was really required was to know the rifle and cartridge, control my breathing and trigger, then make the connection between animal and bullet. There simply

wasn't time to break out a rangefinder, look at my drop card, and do the calculations—the deer would be gone as quickly as they had stepped into a shooting lane.



Author at the benchrest getting some time on paper targets. You can never shoot enough.



This is a 1-MOA group and it's what you should be training for when shooting paper targets. Anything less and long-range shooting won't pay off for you as you extend that distance to the target.

Let's take a look at another example, a swamp in north-central Minnesota, with a 15 mile per hour wind and blowing snow and nothing but a half-frozen deadfall to get locked down against, as that deer moves into view. That's trouble, but, as a long-time resident of the Gopher State, I did

indeed kill a pile of whitetails under just those kinds of conditions. I learned to work with what I had at hand, and, in most cases, it wasn't much. Taking a 300-yard poke at a running whitetail from the high top of a jack pine and making a one-shot killing hit is supremely satisfying, but, again, this is shooting from your gut, relying on time over the rifle when conditions were more perfect, when you had time to perfect breathing, trigger control, and knowing your gun and what it does over what distances. You can't do this kind of shooting after a couple dozen rounds spent on the 100-yard range.

CHANGING SEASONS, CHANGING ACCURACY

Temperature must be considered when shooting at long range. When the air is warm, it is lighter, so a bullet tends to fly farther and flatter. As the air cools, the bullet meets stiffer resistance, because this air mass is very much like a fluid that the bullet is passing through and, thus, when cooler, thicker. Cold air in the dead of winter can also affect the burn rate of your powder. At 75 degrees Fahrenheit, a bullet may well hit a velocity of 3,500 fps, but, at 10 degrees below zero, that same load may lose as much as 100 fps. Both the air's density and the slower powder burn rates will cause a major change in your load's performance curve.



Fox hunters know their bullets well, in terms of performance when the temperature starts to fall.

IN THE GROOVE

It's called rhythm. Rhythm is a pattern of self-control that sets in among prairie dog and gopher shooters who are locked into a specific range and are successfully repeating shots at targets that are very close to being at the same range. Some shooters refer to this type of condition as "instinctive shooting" and they may well be correct. Different semantics, but the same general idea.

When this rhythm sets in, I have observed shooters getting dialed in on, say, 300-yard dogs and almost *never* miss a shot. Then, at some point, a close-range dog sticks its head up and that shooter can miss three or four shots in a row. What has happened is that the brain has as yet not redialed the different shooting conditions; the shooter is playing the shooting game with old tapes, versus locking into the new set of conditions.

When setting up for a shot, try and stay tuned to what is going on around you and the requirements associated with that individual shot. To dial in your shots is good when that system is working, but, keep in mind that, as the situation changes, so will your point of aim, wind drift allowance, and overall drop (hold under, on, or over the target).



Rhythm is how a rifleman can dial in on targets close to the same range. Here, crows feeding on a rotting cow at the end of the field are dialed in by the author.

LEARN TO USE A DATA RECORD BOOK

One simple way to get better at what you're doing with a rifle is to record all your shots over a long period of time. When I got well into prairie dog shooting at long range, I started to keep a notebook that contained information on each and every shot I took: Range, wind, temperature, rifle and bullet were all included in my shirt-pocket data book.

After recording hundreds of kills over about eight years, I found that, on average, most long shots are not that long at all, but are, instead, shots taken at ranges at or less than 250 yards. Well, seeing as how 250 yards is the length of two and a half football fields and, as a dog shooter, you're shooting at a target measuring about 2½ inches at the heart, that's still not bad shooting. Yet another perspective: In most cases, 400 yards—almost one-quarter mile—isn't even considered long-range by some riflemen. Yet, in my log book, though there were references to some shots each day at 400-plus yards, they are far less in number than what we often see in bold print by the storytellers.

Are folks lying about the ranges they shoot things at? No, I don't think so, but I do believe that more of them should use a rangefinder a bit more often. Determining range is one of the biggest issues vexing the long-range shooter. Pairing that useful rangefinding tool with a data book will bring into light exactly what kind of shots you're taking—and how successful you are with them.

I mentioned that your data book should account for many shots taken over a long period of time. *Years*. Some of that comes from my background. Remember, back in the early '90s, when my career was really getting into full swing, as you were shooting one rancher's field, another rancher would stop and ask you to please hunt his ranch next, due to a massive infestation of prairie dogs. Yes, those were the good old days, and it didn't take long to fill a data book. Sitting atop a high ridge overlooking a mile or more of dog lodges, a good rifleman owned the valley. Often as many as 200 or 300 dogs would be gunned from a single position, before it was time to pack up and look for new ground. Like I said, those were the good old days. It may take you a little longer now.



The author with an S&W M&P-15-T he suppressed and a fall gobbler taken at almost 400 yards. Practice makes perfect.

ROAMING

The act of roaming with a rifle in prairie country or mountains can be a great training method in long-range shooting. In such adventures, the textbook is truly out the door. Let's say you're wandering around and you come over a ridge, where a fat rockchuck gives you the eye from atop a ledge some 500 yards away. It's now time to bring your quick-action responses together and get sights on the warm target. A quick check of the wind at the muzzle says it's right to left at about eight miles per hour. Meanwhile, the scope shows you the brush on that chuck's rock ledge is moving the other way at about five miles per hour. Cancel out the wind and dope the shot for center mass with a yard's holdover using the first hash mark on your scoped .308 Win. Lock down your body over that bipod and drop three pounds on the trigger. It's as easy as that—well, if you made the shot. If you missed, take careful notes and learn from the circumstances at the time of the shot.

A day of roaming in the mountains may result in several real-time long-range training shots. Even just covering prairie grass can bring the rifleman up against a prairie dog town, badger den, or coyote haunt. Using a daypack, ground cloth, and a bipod, I have walked countless miles of Wyoming and South Dakota, searching out targets of opportunity. Even rolling across the open country in a pickup truck by way of a little-used two-track can yield some great shooting, as you can cover far more area than a man on foot over the course of the hunting day. No matter how you do this, every shot is a real-world classroom lesson, and the more shooting you get, the better you're going to get at this extended range game.



The author with a coyote taken while roaming open country on foot and calling every quarter-mile or so.

START EACH SEASON FRESH

Along with your little field book, it's a good idea to take the time to shoot a single benchrest group with your rifle at the start of your primary shooting season. This group can be added to the book as a record of how the barrel on that rifle is holding up. I learned this little trick from Greg Hendricks, the 1,000-yard competitive shooter mentioned elsewhere in this book. Greg shot such a group with his prairie dog rifle each and every spring prior to leaving for west-central South Dakota, and his annual hunt. If that first-season group started to open at all, he knew it was time to start thinking about a replacement.

CHAPTER 13

WHERE CAN I SHOOT BEYOND 100 YARDS?

THERE IS NO QUESTION that the western states are king, when it comes to space and even unlimited range for stretching the legs of a long-range rifle. These states retain vast areas of federal land open to hunting, and many of them have great public access programs.

Growing up in Minnesota, I had to search out areas for long-range work with a rifle, and getting creative was a big part of the game plan. In the winter months, hunting the large expanses of the northern lakes region gave me miles of open space, but the problem, as you might imagine, is that these lands are snowed in for about half the year and varmint targets are few.

In the early 1960s, I relocated for a time to Southern California, where I found the mountains along the coast and to the north of L.A. This was some very big and open country, at least to a flatland Minnesota boy, and I did learn to shoot at longer ranges in that mountain country.

Back in the Midwest, after a time, I learned that powerline cuts can make for great, long-range static shooting locations, as can fire breaks and two-track jeep trails. When these openings stretched along elder swamps and pine ridges, I would sit and call or even just stop and stalk them for critters that ranged from deer or wolf in the fall to crows or woodchucks in the spring and early summer. I followed that game plan over many years, right

up until I left Minnesota, upon retiring from teaching school and the police department.



Big open country is home to the long-range rifleman.

Much has changed in those spaces, especially in California, but the West in general still holds the best places to shoot at distance. Native American reservations, for instance, are often productive. Each reservation has its own rules for non-tribal hunters, but, by taking the time to contact them, you can find that a very positive western shooting vacation can be had. I buy a Cheyenne River Sioux Reservation tag each year. This Lakota Reservation just off the Missouri River and about mid-state is a prairie dog and coyote hotbed. The Reservation headquarters and town of Eagle Butte have everything you need to stay comfortable, including good motels and places to eat. This area is dead-center in the middle of easy access to dog-shooting lands that stretch to all four points of your GPS unit.



Clubs with 800- to 1,000-yard ranges can offer a lot to the long-range shooter.

Clubs and various groups that specialize in varmint and long-range hunting can be a major help, when locating a place to shoot your rifles. For

example, The Varmint Hunter Association, located in Pierre, South Dakota, publishes quarterly reviews of places to shoot, and those reviews have loads of information. This organization also holds competitive long-range shooting events on the club's range, and advertising in its quarterly magazine is arranged by businesses that cater to shooters.

I have been told that hunting western states is a real mess, because you can't find a ranch owner to gain permission from, as the ranches are so large. That's quite true, but there is a way around all that. What I'm talking about here are the available government land maps and state wildlife production, school land, and walk-in area maps. Believe me, by just reading a simple map you would be *amazed* at what is available to hunters. Often, posted signs have been removed from areas, which leave the uneducated to question whether a land's good for shooting, but section lines and roads don't change. The truth is, a quick glance at even a couple of these maps will show dozens of areas that are wide-open to rifle hunters in the West. Wyoming, for example, is about two-thirds Federal land, but you need a good map to find the right locations to shoot that bullet-stretching rifle. South Dakota has miles of Buffalo Gap grasslands to hunt, but, again, you need to know where you can gain access to it.

There's another reason you need a map and a good GPS. During the writing of this book, I was shooting some very long-range rounds with a .50 BMG on Federal land and, within an hour's time, I'd drawn a crowd of cowboy-occupied pickup trucks at the government line gate. Ranchers, of course, are always concerned about what's going on near their homes, just as you would be, but I was as clean and legal as could be, thanks to my research on where to shoot. (One note here: I did find out a bit later that one rancher was grazing about 300 head of beef cattle several miles to the west of where I was shooting the big .50-caliber. He had leased the grazing rights

to the Federal land, but he had no control over the hunting or shooting rights as long as I didn't shoot near those cattle. No matter where you, are and as it is with any shooting you do, you must know what's beyond your target—*especially* with long-range rounds.)

As much as the West has to offer the long-range rifleman, don't overlook the eastern side of the Mississippi. Smart hunters and shooters can and do find that there are ways to get a lot of distance out of their rifles, even when they're surrounded by timber and rolling hills. Over the years in the outdoor writing business, I have all sorts of experience in 1000-yard ranges and hunting in states such as West Virginia (without question, a woodchuck honey hole). The East has shooting, and a lot of it, but you need to get out and work from a basic plan if you want to keep viable, target-rich real estate under your feet.

As a final note on available land for shooting long range, I'd advise you stay away from states that are landlocked by private outfits, as well as states that don't retain much if any public or federal land. You will find a high price tag in these areas, when it comes to varmint or big game hunting access.

Okay, let's say you like something a little more formal for your shooting. Especially for those to the east, the Internet is likely a sound place to start looking for a place to shoot. I did a quick Google search with the term "1,000-yard shooting ranges," and top of the list was The Original Pennsylvania 1,000-Yard Benchrest Club, Inc. (www.pa1000yard.com). That was followed by a dozen others—no, you're not going to find one down every dirt road, but they're out there. It's certainly worth a few minutes at your keyboard and on the phone to find out where.

In terms of gaining additional skills in long-range shooting, there are several outfits around today that offer training programs for this sport. They

allow you to stay on site and work through special hands-on classes that teach long-range shooting skills over several days to a week sometimes. These programs can be discovered through major shooting publications, gun shops, and other shooting-related venues.

RENT-A-HUNT?

I call some of the operations in the shooting and hunting business today “rent-a-hunts,” because everything from the time you hit the front gate to the hour you leave has a price tag on it. For the shooter who is tight on time, these hunts are very efficient and, in most cases, the results are positive—well, they are if the guide or dude ranch operation wants to stay in business very long.

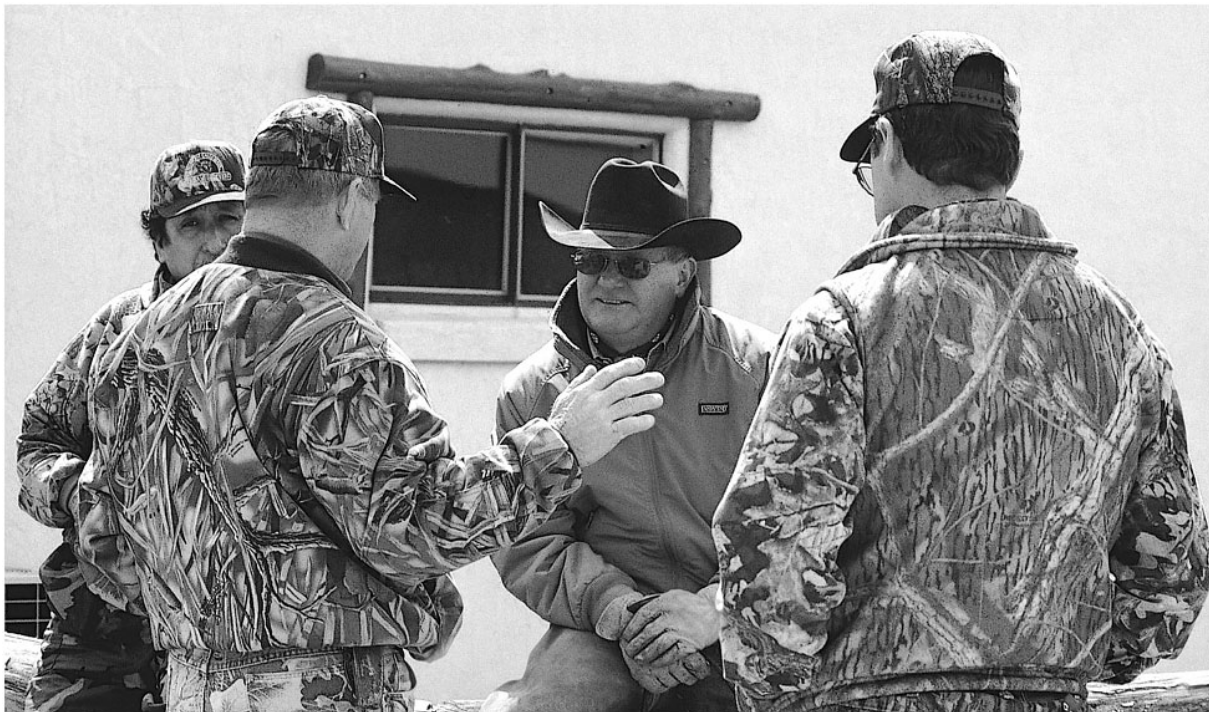
While it’s certainly easy enough to find operations where all the scouting, lodging, and meals can be arranged for you in advance, hunting with the long-range rifle can often be accomplished using pay-by-the-day operations in western states, where you’ll get into more wide-open country and that super smokepole of yours can see some real work. As an example, take a look at Ken Hutton’s H-Crown Outfitters, in Hulett, Wyoming (www.hcrownoutfitters.com). That’s near the famous Devil’s Tower formation and where I let out the horses on the big .50 BMG and .308 Win. Ken hunts about everything on his operation, including all Wyoming big game found in the area, and he will accommodate hunters who want to take a crack at long-range prairie dogs and other assorted varmints. Inasmuch as Wyoming will not charge you for a varmint license, which is very different from most states now days, that is one part of the bill you can leave behind. Outfits like Hutton’s are often a good deal for hunters who want to take on some of the hunt themselves, but with a bit of guiding thrown into the mix

as needed. Ken will set up his hunters either way, and he's easy to work with afield.

As UPS drops off new gear to be set up and tested for this book and other projects, I found my way to Ken's H-Crown many times for hunting and shooting. This operation has space to burn, with miles of open rolling sagebrush being just what the long-range shooter ordered. I also use the Goehring-Routier Ranch near Buffalo, South Dakota (www.routierranch.com). The Routier spread can line you up with accommodations in town, camping, or on site, and the property sprawls along the South Dakota/Wyoming border. As it is with the H-Crown ranch, I use this kind of setup because it offers an easygoing approach to hunting, and these straight-up and honest folks will get dog hunters on rats, turkey hunters on gobblers, or deer and goat hunters on trophy animals.



The author with a guide during a Texas cat hunt. Guides can be a big help locating targets in areas you're not familiar with.



Never pass up the chance to talk with a rancher. This little discussion netted our group four full days of great coyote calling, in Oklahoma.

BUILD YOUR OWN

Within the past dozen or so years, I've learned a good deal about setting up a range that can service shooters in the long-range game. For me, in my neck of the woods—well, probably for anyone, really—I found that the primary obstacle was getting a rancher or farmer to go along with loaning some spare rangeland. Real estate, bar none, is likely going to be your biggest hurdle.

Once you have real estate, when it comes to setting up your shooting range, what I've found that works well is the acquisition of some old tires with steel wheels attached, mounting them to a couple fence stakes at measured ranges. These tire and wheel combinations are easy to find for the most part, hold up well under the stress of being hit by large-caliber fodder, and tend to return a solid audio slap when hit by a bullet. If you can't find

suitable materials or don't want to haul it out to a piece of land (especially if you have to remove it after every use), another very good choice can be a large boulder in the middle of a pasture or up against a steep hill. For one of our test ranges we built and have used regularly over the past year, the ranges covering 100 through 300 yards are all large white stones. Our 400-yard target is a steel gong hung by chains and, at 500 yards, the target is an old scrap tractor tire and wheel. The 600-yard mark is the edge of a water hole, and the 700-yard mark, the safe limit for this particular property, is the far side of the same cattle stock tank.



Tom Hanson setting an old corn planter tire and wheel in place as a target at 400 yards. Using junkyard parts is effective and won't cost a lot.



A steel plate and tire rim make up a suspended target at the 300-yard mark.

To shoot well at long range you have to shoot long range, and that's about the end of that story. Sure, good groups at 100 or 200 yards are great training for trigger control and testing for accuracy in ammunition. But shooting at these limited distances leaves out that old nemesis wind. It also won't show the extreme variations in different rifles, shooters, and other weather conditions. In short, there is no substitute for shooting at ranges in which you expect to acquire warm or cold targets.

CHAPTER 14

THE NEW LONG-RANGE GAME IN TOWN: RIFLE GOLF

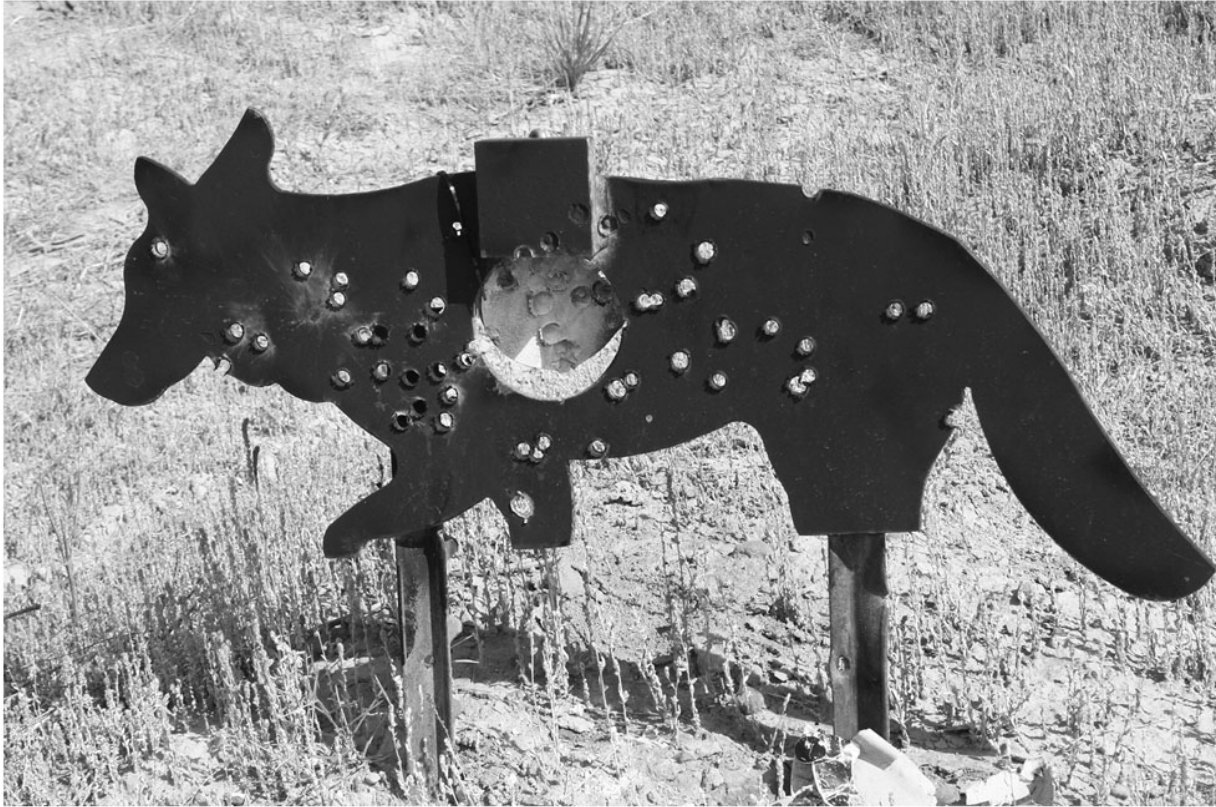


RIFLE GOLF IS A new adventure in shooting high-power rifles at very long ranges for score. The game aims to represent a natural way to shoot, with steel targets placed at ranges a big-game or varmint hunter would consider workable.

I found my first rifle golf course in southern Utah, on the high desert plain near Castle Valley. The outfit of the same name, Castle Valley, is an upland and big-game operation that tends to lay out across not acres, but rather mountain ranges—it has room to burn, perfect for this game.

Shooting a game of rifle golf at Castle Valley, involved taking on life-size steel animal targets ranging in distance from 175 yards to 1,000 yards. The targets featured eight- to 10-inch “vital area” flip plates. When hit, these special sections would give off a loud ringing sound, quite different from the dull thud heard when the bullet contacted any other point on the targets. As such, only the vital section counted as a hit.

Like the actual game of golf, rifle golf is played with a par scoring system, with the difficulty level marked on the range card at each shooting station. For example, a 630-yard mountain goat was listed as a par five, i.e., it took an average of five shots to hit the goat vitals, using equipment that had been set out on the course. Though there were a few targets set up at 100 and 200 yards, on average, the range at which most targets were engaged was somewhere between 650 through 730 yards, with more than a few out to 1,000 yards—it was not set up for the average hobby shooter.



A steel coyote taking a pounding. Only hits on the center circle count for score, regardless the range or target size.

RIFLES

The rifles selected for our shoot at Castle Valley all had to have the ability to group under $\frac{1}{2}$ -MOA at 100 yards. Anything over that and the rifle is discarded from consideration. When you're shooting to 1,000 yards for a score, any degree of group expansion will result in bullets well off the 10-inch kill zone designed into the steel moose and black bear targets out on that far away ridge. Even the 600 and 700 yard shots on goats and mule deer required an eight-inch group when shooting for core, and a rifle that shoots only MOA won't cut it.

Several Remington VS turn-bolts, those variants on the U.S. Army M-24 rifle, were eventually deemed worthy of this new game, as was a single ultra sniper from Steyr Arms, the SSG08. All of them were chambered in

.308 Win. In the auto-loader department, a group of .223/5.56 mm NATO, .22-250 Remington, and 7.62mm NATO rifles from LaRue Custom ARs was selected. I elected to shoot turn-bolts and also stay with the .308, as I knew from living in the West that, as the day progressed, we would see higher velocity winds, up and down drafts, and other changing conditions downrange.

My team started with a Remington VS bolt-action. However with only two shooting stations and four members on board, one of the range officers suggested we speed up the action by having me move to the far side of the shooting line to get acquainted with the Steyer SSG08.

We had been schooled on a new Trijicon scope, the TARS, during a previous classroom setting, and, as such, the rifles had been already doped to 1,000 yards. Each rifle possessed a clip-on range card for elevation values of 50 yards through 1,000. (By the way, Trijicon will produce personalized ranging cards for any scope owner who submits the brand, bullet type and grain weight, muzzle velocity, and altitude at which the rifle will be used.) This doping of a glass sight is, in my mind, a major key to successful long-range rifle shooting. After knowing that information, the rest of the deal is simply range recording, breathing, trigger control, and practice with your rifle.



The author with a Steyr sniper rifle in 7.62x51mm (.308).

Settling down on the shooting mat behind the big Steyr sniper rifle, my assistant and spotter advised me to rotate to my right and locate the black bear target at the top of a ridgeline that was very far away. A range of 1,000 yards was the call, and the range card assigned to the Steyr indicated a turret rotation of -41.7 was the needed correction. That involved a full turn of the turret plus several more MOA graduations into the second turn, actually a piece of cake on this scope, as the turret has a full three turns of elevation, if that many are ever required (2,000-plus yards).

Shooting the .308 in a Federal Premium 168-grain Sierra MatchKing, I was soon to see the choice was a very good one. With the TARS glass adjusted and a dead wind, I touched off round one and, in what seemed like forever, a dull slap came ringing back from the mountainside. My spotter indicated a miss, the strike punching the center rump of the steel bear. I made a very slight pull into what could have been wind, touched off round two, and sent that bullet into the bear's neck. Getting the hang of 1,000-yard shooting was taking a bit of time, but at least I was on steel. One more sight adjustment for windage and the bell rang loud and clear, the flip plate taking a direct hit and opening wide in the spotter's scope. My first score at 1,000 yards!

By this time a line was forming to shoot the big German gun, so I moved off and next got hold of a Remington bolt-action VS-type rifle. Now it was time to shoot the full range of the first in a series of three target events that were installed across a mountainside.

With a spotter calling the targets and the range, I settled down over the turn-bolt Remington, lifted the elevation cap to access the turret, and locked onto the steel pronghorn that was called and ranged at 447 yards. Checking

my range card, the scope would require -9.5 MOA in adjustment to gain the proper elevation against the life-sized steel target. With sights adjusted, I checked with my spotter and then sent the round downrange. Crack-whop! The bullet slammed into steel, and a ringing sound came back down the steep mountainside, a hit, my spotter acknowledged, and he quickly moved on to ranging a steel mountain goat at 570 yards. Again the turret was adjusted, this time to the -15.7 mark, but I had to keep in mind that the TARS wasn't a perfect system, especially as the targets were staggered across the ridge; exact corrections were not possible all the time; estimated windage and the shooter's gut feeling counted for a whole lot. Make no mistake about it, having the TARS drop factor spelled out for the shooter took care of about 90 percent of the equation, but there is *always* a human element involved in accurate long-range shooting.



Scope adjustments are critical in this game. One click off and you miss everything.

Finishing up the practice course, we were pleased to hear that, after scoring our three teams of shooters, we would require a course upgrade to a Masters Series of targets starting at 600 yards and going to 1,500 or more. Why? Well, in essence, we had taken a basic par five course and reduced it to a par one. No, that's not a misprint. We shot the course to 700 yards in the training mode and cleaned almost every target, across the total group of shooters, with a par one, or one-shot kills on every one of the eight- or 10-inch vitals.



Halfway up the mountainside, that small black dot is a deer target. It is 900 yards away and the vital area for score is an eight-inch circle. Not a lot of room for error, eh?



A shooter and coach during a training run on 1,000-yard rifle golf targets. It takes two!



Clockwise from left: Cory Lundberg, an old coyote hunting partner of the author's, about to turn loose his Savage Predator .22-250 on the rifle golf course; Castle Valley's range master shows a shooter the basics of turret knob elevation adjustment during some 1,000-yard shooting via the Steyer sniper rifle; A deer target with the "vital" circle center mass.

After lunch, the real world of long-range rifle golf got underway. Now the warming air currents had started to generate shifting winds of five to 15 miles per hour. At times, they were full-value crossing winds, others they were head-on or following the bullet. Not only was wind now a factor, but the element of time had been entered into the game, and now each team was shooting against another team, as well as against each other individually. The pressure was on.

At the line, each shooter had exactly three minutes to get off six or more rounds on six targets ranging from about 440 yards to 691 yards. Yet even with the building midday winds, some shooters shot very well on that first round. I, on the other, had decided to drop the use of the turret adjustments for elevation and turned instead to the MOA graduation etched into the lens. Bad idea. Right off I became confused, and coupled with the fact that I was shooting a turn-bolt against 7.62mm ARs, my time went straight into the tank. The round was a bust and put me out of any contention for top gun. A learning curve here? You bet it was, and after that round I stayed with my turrets on each and every shot.

Back at the turrets, round two of the advanced course saw me returned to a 100-percent par one score, at 2.4 minutes timed against a gamut of 73- to 650-yard targets. Win, lose, or draw I was pleased with the results and very impressed by the outstanding optics that had made the successful round possible. As for the reticle MOA hashmark issue? I do believe that, when I have the chance to take home one of these scopes down the road, that problem will quickly go the way of the buffalo. Time on the rifle with the

glass is the answer to gaining quick target acquisition with the TARS using the lens markings and bypassing the turrets.



The author looking pretty happy after he aced the first course.

Rifle golf is coming on strong in Utah, where space abounds and shooting courses like this can flourish. Castle Valley has a wide range of shooting activities available, including upland and big-game opportunities. The lodge is nothing but class AAA, and the guides and staff are among some of the best and easiest to work with in the business. Rifle golf is dead-on training for hunters, much better than target punching benchrest events and even better than the 3-Gun competitions. I believe it is the very best training bar none for the hunter who wants to improve hands on accuracy with their rifle at a very high level of training.

DOWN UNDER AND CATCHING ON

Australia is a very long way from home, when you live in western South Dakota, but, after meeting a number of “mates” that reside near a place called Toowoomba, along the Gold Coast, in Queensland, I have ended up spending a vast amount of time hunting pigs, culling kangaroos, and taking up some long-range shooting in general at the bottom of the world.

On my last run there, I was hanging out with my mate Scott Wethy, a stockmen in the Toowoomba area, when we were approached about designing a rifle golf range for general shooting events, as well as a government-only sniper range set up expressly to mimic the types of targets encountered in Afghanistan, and other mountainous locations. I can tell you that in spite of some totally off the wall gun laws in Australia, the outback folks, who are well away from the city types and live on the cattle stations or in other rural areas, have a real love affair with long-range rifles and shooting sports. Scott, for instance, happens to own some vast country, as well as a certified gun shop in Crows Nest, Australia. For hunting kangaroos, pigs, and deer on the seemingly endless mountain ranges that blend towards the seacoast, Scott’s operation makes for some interesting shooting, with running shots often at 450 yards and more.



The author's Australian buddies Scott (left) and Mike, with their guide Mark to the right.



Though it hasn't hit the big-time yet, the long-range game of rifle golf is catching on—even in Australia! When you're done with the steel targets there, have a go at some 'roo meat for the camp dinner pot.

“The Glen,” the countryside where we set up our long-range rifle golf course, has targets at a 1,700-yard maximum range, and there are targets that start somewhere around 100 yards, with lots of others at all the ranges in between. It takes room and lots of it to build a safe course like this. All bullets need to be backstopped, every time, and that means terrain that accommodates this. Places around our own Rocky Mountains, for instance, can be ideal for such range projects, and that's the kind of terrain we were lucky enough to have on Scott's property in Australia. It's just another example of where this new game of rifle golf can go, and also one that continues to show the growing popularity in long-range riflery.

CHAPTER 15

PROFESSIONAL GRADE

THIS CHAPTER HAS COME to fruition due, for the most part, to the United States' continued war footing across the free world. For a very long time, the sniper wasn't discussed much, even among authors of military lore, let alone rushed to print in any mainstream magazine. Why? Because snipers were presumed to be the "bad guys" who didn't play fair, always doing their work from the shadows, behind walls, or in the deep cover of a jungle environment. But, with the increasing insurgency style of warfare we have now, things have changed, and, today, that means the sharpshooter is the forward scout, the over-watch protector of his fellow soldiers who advance on enemy positions, the taker of the real bad guys in the dead of night with one well-placed shot, and the dedicated, sit-by-the-hour marksman dressed in a city or state police uniform covering some nut case holding hostages and waiting for the order to "Take 'em out."

Looking back, the truth is that professional riflemen like the famed Russian sniper Vasily Zaytsev, part of the Red Army's snipers (*Enemy At The Gates*), and Lyudmila Pavlichenko, one of more than 1,000 female Russian snipers credited with saving thousands of fellow comrades during WWII, were major factors in pushing the Germans out of Russia. (The Russian army alone, according to historical data, has made better use of snipers than any other army in history, based on their effectiveness during WWII.) On the home front, anyone not living under a rock knows the

moniker “White Feather,” the nickname given famed Marine sniper Carlos Hathcock. You can also reach back to WWI and Sergeant Alvin York, famed for his talents with his open-sight bolt-action Springfield, a gun he used to raise pure hell in the trenches of France, against the Germans.



The Remington XM 2010, the U.S. Army's new sniper rifle in .300 Win. Mag.

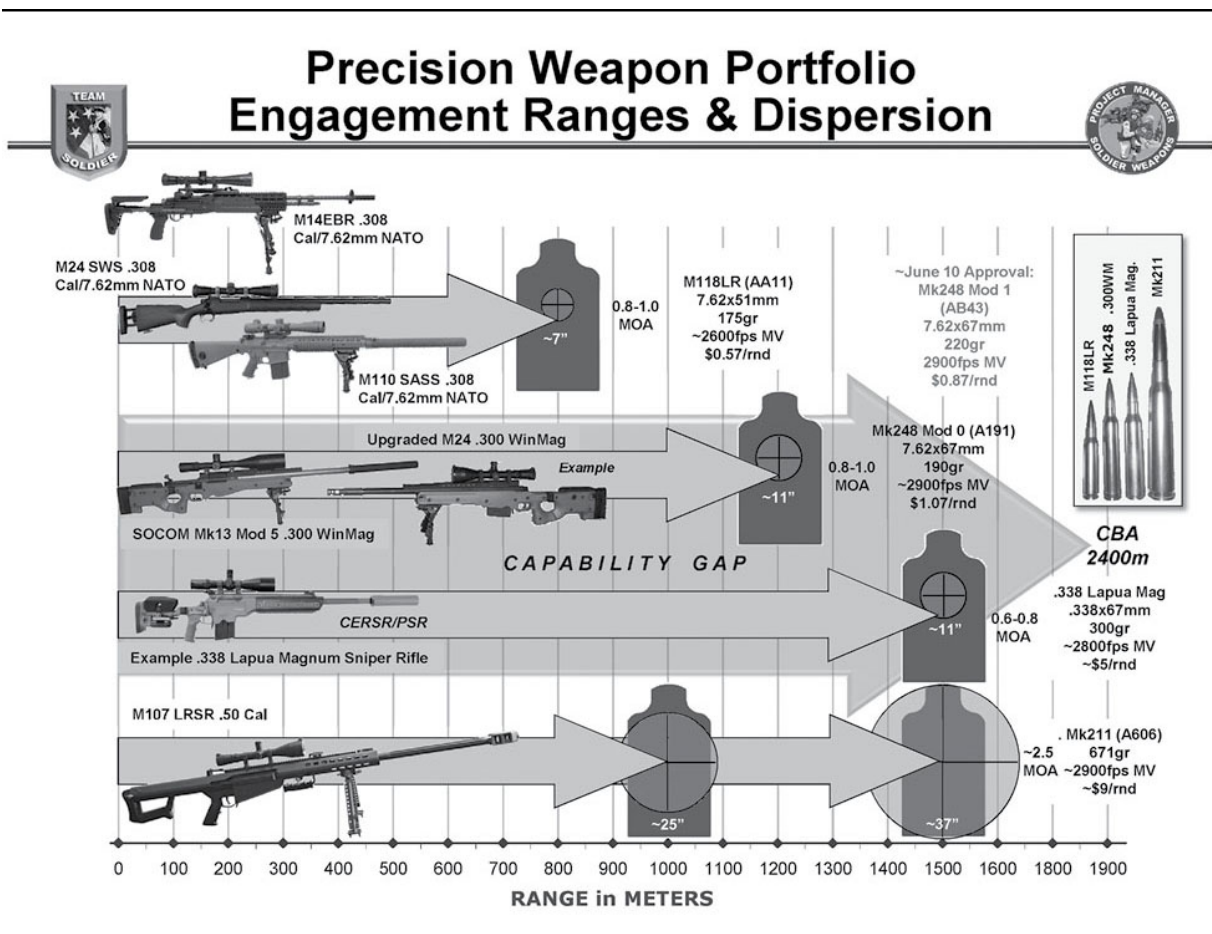
Snipers have always been among us. Today, however, instead of disbanding these units after a military operations have ceased, the long-

range marksman is not only retained, but has advanced to a position where they can take care of all sorts of field business, still while always watching over their flock of professional soldiers around them.

Often the best of the best are born sport hunters from states like Texas, the Dakotas, Wyoming, and the deep South, this last drawing from their squirrel hunting mountain ancestors. Some were interviewed for this book, while others, like the late Chris Kyle, have left a well-publicized legacy for us to learn from. I could go on and on with examples of excellent marksmen and woman, but I think you can get the idea.

AMERICAN SNIPERS

Interviewing military snipers, both Army Rangers and Navy S.E.A.L.s, as well as special unit police officers, gave me a solid picture of how long-range shooting measures up in the professional's eyes. These men weren't selling anything, and, as such, I got something from them that is rare nowadays—the truth. These men are active professionals who made their daily pay by hunting men only sometimes; if a movie were filmed that followed the day to day routine of many of my interview participants, I can tell you that it would be seen by few, and those who did watch it would be bored to death. There is an old saying among street cops: “Eight-five percent of the job is pure boredom, and 15 percent is sheer terror.”



From the professional marksman, the average shooter can learn much.

“Brian”

Let’s call my first interviewee simply “Brian” and leave it at that. Brian is still working his craft, but now out of the Army and being paid well by a civilian contractor to do the work for which he had been well-trained over four years and four separate tours with the Army Rangers over in the sandbox. As a sniper, Brian took on the task of mostly night warfare, he and his spotter assigned to take out designated bad guys with the aid of a well dressed M-110 7.62x51mm.

Brian explained that, for the most part, his work stopped at or at least was designed for shooting situations that didn’t exceed 600 yards. Sure, he could shoot farther, but there were issues with target identification. Working

at night with a list of targets, the mission could be considered that of using a scalpel of sorts, in that only one or two shots would be required. Other times, the team would bring a “chainsaw” to the fight, carrying several hundred rounds of ammunition. Brian told me that, when other members of a team were loading up on MRIs and junk food, he was packing extra ammo for the M-110.

When I asked about the old rule book quote of “one shot, one kill,” he smiled widely and said there were times that kind of rule just doesn’t work out. “You mean to say that you could, as a sniper, go through most of your ammunition in a single night’s operation?” I asked him. The answer was “Yes.” Well, folks, so much for all those confirmed kills stats, because even doing some poor math, these snipers and their auto-loading, medium-caliber centerfires *owned* the night. They *had* to have piled up some nasty body counts over the course of their time in country. There are no names given, no war stories, and no books written about them, just flat-out results produced as we sleep in our warm beds. Thank God they’re on our side.

When asked about equipment other than the gun, Brian told me that a handheld ballistics computer was always taken into the field; Field Firing Solutions IV or Nomad L800 units were often used. Brian kept his system after leaving the service, but said that because he didn’t believe he was some sort of math whiz kid, he also relayed on gut-level, instinctive shooting much of the time.



A deadly serious sniper rifle in .416.

“At times, there was just not enough time to take up a solutions system,” the South Dakota native said. “The bad guy is in the scope, with his AK-47 dangling across his back, and it’s crunch time.

“At ultra long range (600 yards), at night, we would search for anything that would give the target away,” he explained. I waited for him to continue, but he was guarded, and for darn good reason: Nail that first bad guy at a given range and the rest of them are easy. You may think this sounds a bit insensitive, too casual, but think about it. This hard-as-nails rifleman had waited out targets for a full four years in Army Ranger combat. He took up over-watch positions, guarded incoming convoys from enemy snipers, then cut through the black of night to locate targets of opportunity. That’s the reality of war, and there’s no doubt you have to look at the world a bit differently under those circumstances.

Brian told me that even in a combat theater, training was ongoing. A typical drill could involve several hundred rounds. Brian said, “When you shoot a great deal and often, you tend to know your rifle and selected round.” Brian liked the M-110 a great deal, but indicated that the SOCOM-cleared SCAR, the new infantry rifle for the U.S. Army and special operations units, is moving up the favorites ladder quickly. The older Remington Model 700/M-24 is still in service for training, but is being replaced quickly by .300 Win. Mag.-chambered rifles, and the soon to arrive in theater (if not already there), Remington XM2010.

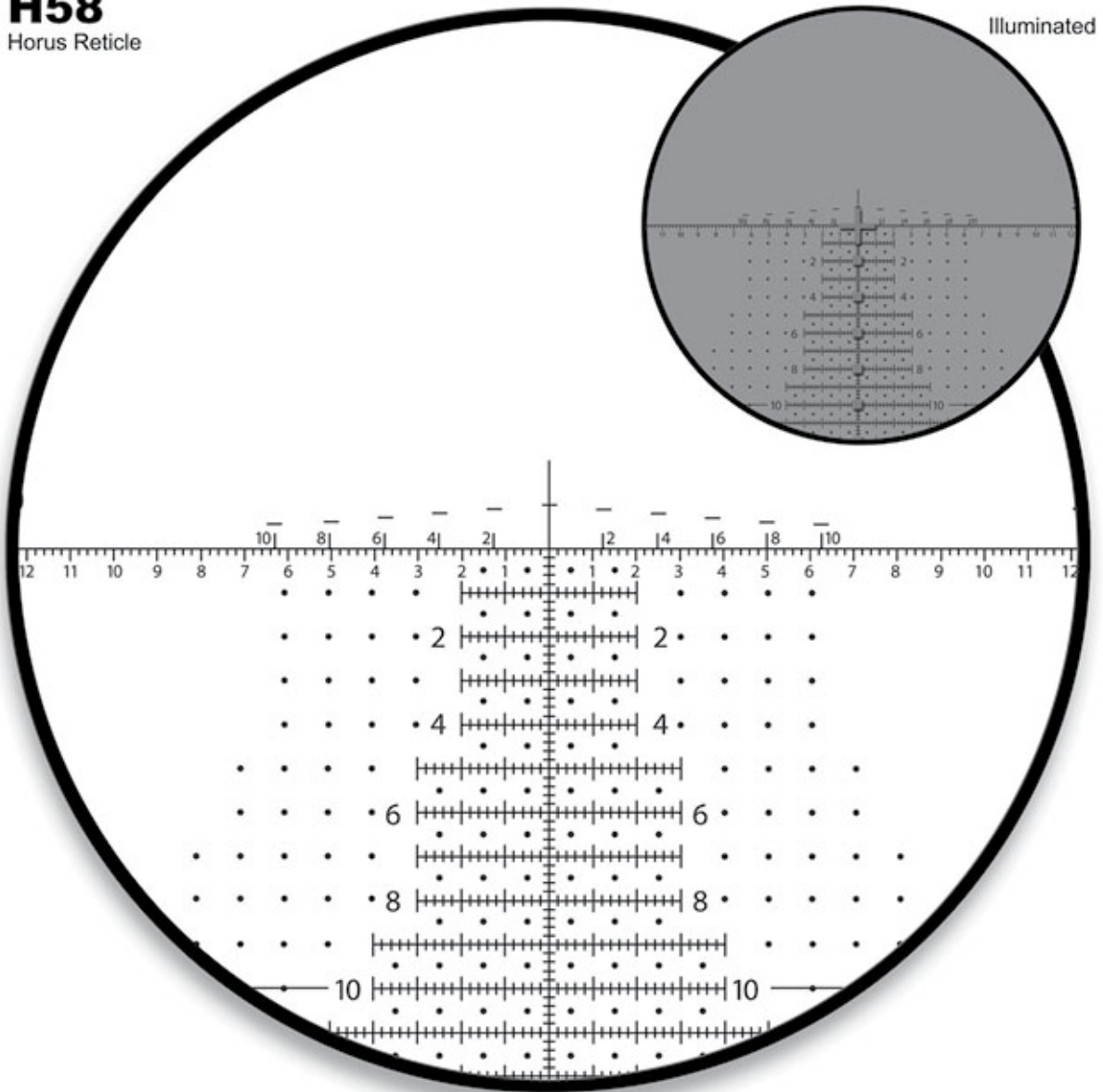
I got the chance to interview Brian on two separate occasions, and it was during the second session that he answered a burning question of mine: How and when did Army Ranger snipers train for the long shot? Brian explained that yes, his company performed a good deal of its training at ranges well beyond, say, 600 yards, though they kept in mind that the 7.62x51mm NATO (.308 Win.) was about played out at 800 yards and dead in the water at 1,000, so over-extending this round was a bit foolish. “We watched bullets do all kinds of crazy stuff after 800 yards and, at times, even well before that distance,” he said.

He continued, “Send bullets by the thousands to long-range limits and something is going to get hit sooner or later. With the modern suppressed firearms, Generation III-plus night optics, and even additives in powders that reduce muzzle flash in darkness, holding to the 600-yard range, especially at night, makes a whole lot of common sense. The enemy won’t locate you when he is already dead, and it won’t take as many rounds to complete the mission.”



H58

Horus Reticle



The sniper's friend.

As Brian tells it, the major element in success at long range is repetition of the skill set, and always with the very same set of tools. Military snipers and sharpshooters use the same rifle and ammunition every day. Civilian shooters, on the other hand, which include competitive shooters backed by industry or military sponsors, often shoot different brands and lot numbers of cartridges. Make a single change in your setup at the bench or shooting

mat, though, and *something* will change downrange each and every time. That's something to consider, as you work towards perfecting your long-range skills, especially given the continued shortages of components in the consumer market.

Finally, I wanted to know why this sniper left the military after such a long and eventful run at the craft? It was simple, according to this American war fighter: "When in the field, it was game on and interesting, at the least. But, when the game was played out and it was stand-down time, it got very old, very fast. Plus, officers who didn't know much of anything gave the orders. Even under fire, snipers have to wait for someone at the rear and not even in the fight to give the go ahead for the shot." Brian just flat-out got sick of the whole thing. Besides, as he also told me, "The new Blackwater [Academi, LLC, formerly Xe Service, LLC, formerly Blackwater Worldwide] team pays much better!" Indeed, and more power to him.

One Feather

One Feather is a Lakota Indian straight out of western South Dakota. In the military, One Feather, being all we will refer to him as, was a Navy Corpsmen who was not about to be shot at, as he choppered across the battlefield, patching up his buddies and transporting them back to a medical aid station. One Feather told me that, as a part of an OJT Scout Platoon, he quickly moved into a dual role in the Navy, one that was both as a corpsmen and a sniper. It's common practice in the Navy's ground force to carry more than one roll or task within a platoon level. "About half the time, while working at the hospitals taking care of my medical responsibilities, I would visit the rifle range and train with my M-14 or M40A3 7.62x51mm sniper rifle," he said.

When asked about his training schedule, the soldier told me that he generally shot about half the week, in terms of active time on base, and that

involved about 150 to 200 rounds per day. Training was everything, in that you only have what you had committed to muscle memory when things got hot and wounded brothers were waiting on your help. This kind of training is common in both the military and among dedicated shooters in law enforcement ranks, but what surprised me with One Feather was that he tended to favor the M-14 (the replacement for the older M1 Garand) or a variant of the same rifle. That added element of the 20-round magazine was a good thing, and the .308 round made for a sniper rifle that was mission-capable at distance.

One Feather told me that, at times, some units used other rifles, such as the .50 BMG or M-110, but the weapon selected always came down to the mission. For instance, a tight area in a village required lighter weapons with higher rates of firepower, while over-watch shooting utilized turn-bolts or large-caliber autoloaders.



Waits can be long and take place in all sorts of horrible conditions. In other words, being a sniper is not for the faint of heart.



Professional marksmen most often work in teams.

When asked about his range practices for distance shooting, One Feather explained that he trained for everything from a 300-yard “close” shot to the 800-yard or more event. He also told me that he’d purchased, with his own funds, the Leica 1200 Scan rangefinder. According to this sniper, it was fast, accurate, and got the job done. In many cases, he said, there was no time to mess around with calculating some advanced handheld unit for exact range and bullet performance. Instead, he doped his M-14 across the full range of target stations, starting with the 100-yard zero. Using military Mil Dots only (I assume the Leupold M-4 scope), One Feather set up a range card for his bullet and rifle. This card’s data was committed to memory, most certainly a time saver when needed most.

When the subject turned to reticles, I mentioned the Horus reticle and One Feather bulked a bit. “The Horus is a good design,” he said, “but it gets messy when you’re trying to see if a possible target has a gun or it’s just a stick. We had to identify our targets with care, and that is the reason I

preferred the Mil Dot reticle, because it was a clean field of view.” (I’ve paraphrased him a bit here, but it is accurate in terms of this sniper’s opinion as to what gets the job done.) One Feather also indicated that he has shot over just about every known reticle while in country, but, when selecting the one he wanted to take into battle, he always came back to the clear field of view and the Mil Dot.

Dusting off bad guys via a BlackHawk chopper was so common a task with this war fighter that One Feather actually spent designated time in the air each week (about a half-hour, he said), making fly-over passes on a steel target range, where he’d take out random targets from his open door chipper position, using his M-14. “We would shoot 100, 200, 300, 400, 500, and 600 yards on a pass over the targets,” he said.

Leaving the service, One Feather turned to contracted work in the Middle East for a time. “You have to pay the bills somehow,” he explained. That time in country as a civilian contractor (via Blackwater) gave him additional experiences that, along with those from the Navy, allow him today to train police, military, and civilians at the CorBon Training Center near Rapid City, South Dakota. When this rifleman isn’t shooting, he is steeped in the learning curve at the University of Minnesota, studying to be a doctor.

One final thing One Feather shared with me was a hunt for South Dakota antelope he took after he returned to the states. When he got an opportunity, the animal was ranged at 1,000 yards. Instinctively, he set up on the target, adjusted for correct Mil settings, and sent a round downrange. Missing by just inches and observing the “splat,” he corrected a small part of a Mil and sent another round, this time into the neck of the speed goat. That was the last time One Feather ever hunted anything. The powers of the universe only know too well what this man has witnessed over his extensive time in

combat. For that, I and many others are very grateful for his service. Feel safe in your warm beds, my friends, because those One Feathers are still out there, still taking care of business.

The Police Sniper

Spending 23 years working as a cop, I got to meet and work with a number of special unit snipers. Call them S.W.A.T., ERU, or whatever, these are the officers who always carry a special go-pack and sniper rifle, mission ready at a moment's notices. They are firemen in an armored truck with a gun, if you will, always at the ready to take on a nasty scene, secure an area, and complete the mission.

I will simply call my first police sniper and friend "Rose," short for Vernon Rose. This officer was attached to a city sniper team and, as such, found himself on many nights and days in church steeples, on stadium rooftops, or in some resident's bedroom, sighting across a few to several hundred yards and into another building's window. One assignment saw him perched upon a foot of fresh snow atop a garage roof, along with his partner spotter, for most of a night. The temperature had dropped to minus-10 degrees Fahrenheit, and the pair had a 20 mile per hour wind in their faces. Being as how they were set up on a barricaded cop killer, moving anyplace off that position just wasn't an option. It's a tough job.

Even though Rose trained a great deal with military instructors and had attended several sniper schools created by the U.S. Army and Marine Corps, his work was different from that of the military sniper. For instance, at one point, while in training with the Marine Corps' special sniper units, Rose was instructed to take on 300-yard walking targets. When the scores came back, his instructor barked at Rose, because he hadn't shot center mass (typical military sniper style), but had, instead, made his 100-percent

hits in the heads of the moving targets. That's what he'd been trained to do in his role as a police officer.

Point is, police snipers generally shoot at a closer range than do military snipers. Even then, they don't actually shoot much at all. Rose told me he had worked as a police sniper for more 15 years and in that time had never taken a single shot at anyone. Not that he didn't have the clear chance, and multiple times, but he needed the green light from his command center and it just never came. Police departments retain a host of specialized officers and personnel who are trained to take down a suspect in such a manner that no one gets killed, so the police sniper is really an over-watch member of the team, the "just in case" guy.



The author's friend and retired police sniper Vern Rose makes use of a block of wood and a sand bag as a rest. Vern was trained to use anything at hand when on location in a sniper "green light" mode.

Rose tended to favor the M-14 as his personal weapon, but his assigned rifle was the Target Model 700 Remington (VS). Much like the Army M-24, these target-stocked, medium-weight barreled .308s are tack-drivers,

and Ross trained often at 200 yards with this gun. Because his unit trained much of the time at my home club rifle range, I spent many days over a benchrest with Rose, sending rounds into tight, sub-one-inch clusters. As a police sniper, he had to be prepared to make the brain shot. His sniper team carried 25-cent pieces on dog tag chains, each with a single .30-caliber hole in the center. That was the final mark of a police sniper, after basic training was completed in his local S.W.A.T. unit.

Now retired, Rose still keeps a sniper rifle and takes it afield sometimes, just to say sharp. I don't believe these hard-won skills ever go away for such a shooter, and, in fact, I believe that, when a sniper comes full circle, those rifles, sights, and bullets become a part of exactly who they are. Today, some many years into retirement, Rose and I still stay in contact. We talk rifles, war stories, and, in general, act like the couple of old cops we are. One thing we totally agree on is the old-school standard of doping your rifle, using your Mil Dots effectively by committing their ranging elevation points to memory, and practice every chance you get.

State Trooper Dennis Mez

South Dakota State Officer Dennis Mez, like some of the military snipers interviewed for this book, is a marksman able to quickly transition from one skill set to another. Regularly an officer who employs K-9 responsibilities, he is sometimes called on to kennel the dog and assume the role of a trained, precision law enforcement sniper.

South Dakota has what Officer Mez terms a "part-time" sniper unit. That means that some of its patrol officers are trained to transition to sniper duties when called for. They are not concerned with ultra long-range shots, and center mass targets are not a part of the plan. In most cases, if called upon to acquire a target, the range would be short; training will generally run out to about 300 yards, maximum. The reason for short-range shooting

is that these State Troopers are trained for the tight-group head shot, versus torso-mass shooting. Also considered in these limitations is that, out here in South Dakota, the wind is always a factor in the shot. Snipers can't take the chance of getting a citizen killed or wounded. What is called "collateral damage" is a real potential and, if there is any chance of hitting a hostage, bystander, or someone well into the background area of a conflict, no shot is taken. Like I said, it's different than in the military.

Officer Mez told me that his unit had just moved into the new AX Accuracy International rifles chambered in 7.62x51mm NATO. With a potential barricade situation, the round packs enough punch (versus the 5.56 NATO), to get the job done. Ammunition chambered by the South Dakota sniper is the Hornady 168-grain V-Max. The choice guards against over-penetration, again reducing the chance of collateral damage. Officer Mez indicated to me that, of late, sniper assignments have moved from drug interdiction over-watch to far more barricade-type situations, people going off the deep end and ending up holed up in a farm house or town business, with or without hostages. He also told me there had been an increase in calls for their unit in the past several years, and while he didn't say so, I think some of his change in mission description can be attributed to the fact that the big oil and gas rush in western North Dakota has started to change the otherwise quiet and settled western part of South Dakota. More people tends to give way to more trouble, just how it goes.

• • •

Long-range shooting and the modern sniper go hand in hand in many cases, and what is learned by them, in terms of shooting skills and advanced equipment, will always trickle down to the competitive and sport shooting rifleman. These are the modern backbone of unit operations on land, sea, and in the air. Snipers save the lives of the good guys and are takers of lives

less so, those targets on the opposite side of the battlefield, housing project, store front, or beachhead. The primary lesson we can learn from them is that, by understanding their weapon systems, practicing over massive amounts of time, and committing to excellence each and every day, these marksmen flat out are some of the very best at what they do in the world. If we are indeed paying attention, we do nothing but gain from their efforts in the long run.

FOR THE RECORD:

SNIPERS IN HISTORY

TITLE	DATE	DISTANCE	WEAPON	NATIONALITY/MILITARY UNIT	CONFLICT
Corporal of Horse (CoH) Craig Harrison	Nov. 2009	2,475 meters (2,707 yards)	Accuracy International L115A3	United Kingdom, Household Cavalry, Life Guards	War in Afghanistan
Corporal Rob Furlong	Mar. 2002	2,430 meters (2,657 yards)	McMillan Tac-50	Canada, 3rd Battalion, Princess Patricia's Canadian Light Infantry	War in Afghanistan
Master Corporal Aaron Perry	Mar. 2002	2,310 meters (2,526 yards)	McMillan Tac-50	Canada, 3rd Battalion, Princess Patricia's Canadian Light Infantry	War in Afghanistan
Sergeant Brian Kremer	Mar. 2004	2,300 meters (2,515 yards)	Barrett M82A1	United States Army, 2nd Ranger Battalion	Iraq War
Gunnery Sergeant Carlos Hathcock	Feb. 1967	2,286 meters (2,500 yards)	M2 Browning machine gun	United States Marine Corps	Vietnam War
Unknown South African Special Forces sniper	Aug. 2013	2,125 meters (2,324 yards)	Denel NTW-20	South African Special Forces Brigade	United Nations Organization Sta- bilization Mission in the Demo- cratic Republic of the Congo
Nicholas Ranstad	Jan. 2008	2,092 meters (2,288 yards)	Barrett M82A1	United States Army, 1-91 Cavalry/173rd ABCT	War in Afghanistan
Chief Petty Officer Chris Kyle	Aug. 2008	1,920 meters (2,100 yards)	McMillan Tac-338	United States Navy, S.E.A.L. Team 3, Charlie	Iraq War – Sadr City
Corporal Christopher Reynolds	Aug. 2009	1,853 meters (2,026 yards)	Accuracy International L115A3	United Kingdom, 3 Scots, The Black Watch	War in Afghanistan
Billy Dixon	Jun. 1874	1,406 meters (1,538 yards)	Sharps .50-90	United States (civilian buffalo hunter)	American Indian Wars
Unknown Norwegian sniper	Nov. 2007	1,380 meters (1,509 yards)	Barrett M82A1	Norway, Norwegian Army 2nd Battalion	War in Afghanistan
Staff Sergeant Jim Gilliland [A3]	Sep. 27, 2005	1,250 meters (1,367 yards)	M24 rifle	United States Army, 2nd Battalion, 69th Armored Regiment, 3rd Infantry Division, Sniper Shadow Team	Iraq War/Ramadi

[View a text version of this table](#)

SNIPERS OF THE PAST

- Francis Pegahmagabow, a Canadian sniper with 378 confirmed kills, the highest in World War I.
- Simo Häyhä, the Finnish sniper, who, using a standard iron-sighted bolt-action rifle, recorded the highest number of confirmed kills in any major war (505 or 542).
- Vasily Zaytsev, the Soviet sniper who amassed 225 kills during the Battle of Stalingrad.
- Lyudmila Pavlichenko, a Soviet sniper during World War II, credited with 309 kills and regarded as the most successful female sniper in

history.

- SSG Adelbert Waldron, an American sniper who currently holds the record for the highest number of confirmed kills for American snipers during the Vietnam War (109).

NATIONALITY/MILITARY UNIT	CONFLICT
United Kingdom, Household Cavalry, Life Guards	War in Afghanistan
Canada, 3rd Battalion, Princess Patricia's Canadian Light Infantry	War in Afghanistan
Canada, 3rd Battalion, Princess Patricia's Canadian Light Infantry	War in Afghanistan
United States Army, 2nd Ranger Battalion	Iraq War
United States Marine Corps	Vietnam War
South African Special Forces Brigade	United Nations Organization Stabilization Mission in the Democratic Republic of the Congo
United States Army, 1-91 Cavalry/173rd ABCT	War in Afghanistan
United States Navy, S.E.A.L. Team 3, Charlie	Iraq War – Sadr City
United Kingdom, 3 Scots, The Black Watch	War in Afghanistan
United States (civilian buffalo hunter)	American Indian Wars
Norway, Norwegian Army 2nd Battalion	War in Afghanistan
United States Army, 2nd Battalion, 69th Armored Regiment, 3rd Infantry Division, Sniper Shadow Team	Iraq War/Ramadi

AFTERWORD



DEER SEASON 2013 COULD not have worked out better, in terms of a classic example of long-range big-game shooting for this books conclusion. In this case the .257 Weatherby was front and center as I dropped into a flat ledge on a steep hill that fell away about 180 feet to a buffalo grass draw below me, I had been hunting another 100 feet above and to the south of the position but the 30 mph winds and deep cold air coming off the Missouri river made that stand impossible to use at all on this dreadfully miserable below zero morning.

After rolling my RZR into a section of buck brush and setting my shooting sticks in place I uncased a the new Bushnell 1 Mile ARC ranging bino and glassed the far side of the valley floor, so as to gain an exact range recording of the distance to a shallow wash area. The digital number rolled up at 404 yards and, with that, I sat back against the coyote den hole I had selected for a setup point and started to play the waiting game with the local whitetails. By this time, I had hunted a full three days without taking my safety off and, as such, had set eyes on only a single doe that I would otherwise have killed for winter meat, but she was hauling ass full-bore up hill and moving straight way at a full 450 yards when I initially spotted her far across still another valley.

Now on day four, having been settled in by that coyote den for quite a while, I was starting to think it was another bust valley I was hunting. I was wondering about taking a lunch break, when two doe crossed my panorma. They were well out of range, but covering the short distance across the wash area between two steep hills farther down the valley. The winds were pounding the brush above me and downrange, but, on the ground level nearest me was an area in the grass that was hardly moving at all. I knew owned my small piece of this valley, in terms of any level of wind drift correction. Now I was wishing one or even both of those doe would turn and come my way. along the base of the ridge

Glassing my back trail to the south, I took some time covering several deep cuts in the high ridge across from me. That was when I observed movement almost at the exact spot I had recorded my ranging figures earlier. Eventually, I was pleased to see it was that pair of doe whitetails coming up out of the drainage. Oddly, they were both acting a bit spooky, with their tails down and heads low to the ground. At once I figured a buck was close at hand, but where was the critter? My answer came in short

order as a large 5x5 with a heavy, tightly packed rack advanced out of the drainage, then started across my line of sight straight toward those does. He was nose to the dirt, as well, and walking stiff legged in full rut.

Getting on my rifle, I watched the buck move through my scope at a steady but slow pace. *Give yourself a second, L.P.* I thought to myself, *Your in my kill net at no more 430 yards.*

For most, me included, this was a long shot, yes, but everything was stacked in my favor. I had been shooting the .257 Weatherby on our bluff top range near home well out to 500 yards and more with the 115-grain Barnes X bullet I was about to send downrange, knew what it could do. I studied the buck hard. The big guy looked like a horse as he stood in my scope at 6X magnification. These handloads loads and paired rifle had dropped no less then five other long-range whitetails under conditions much like the ones I had now, and I knew the ballistics of this setup like the back of my hand. I just needed the right moment.

For a moment, the buck came to a stop, and in that second, I touched off the .257 Weatherby, sending my home-built deer-slayer bullet downrange.

At the shot, a return slap came back, and the big deer shuddered, then froze in his tracks. He had turned just slightly toward me as I'd touched the trigger, and the bullet had hit him just ahead of the left shoulder blade, then exited across the shoulder, cutting a wide gaping wound that was streaming blood down the back of his left leg. Hit hard but wounded, I thought quickly about the next best shot to take and set the crosshairs exactly on the wound mark, while not paying any attention to the rest of the animal's body. Now the buck was standing broadside, and the second shot again returned the shound of a substantial hit return echoing across the valley floor. The bullet had found its mark, and this time the big whitetail just dumped over

on his side, then sliding 10 yards to the bottom of the hill before piling up stone dead.

Coming up on the big deer after my short hike across the draw, I could see that first bullet had indeed cut across the shoulder and exited the same side it had entered. The second bullet, though never produced an additional entry wound at all, having gone straight through the open wound created by the first shot, then traveled across the width of the body and exited the first rib area on the deer's opposite side. Both lungs and heart were gone; I don't think he ever knew what hit him, as that second bullet found its mark.



The author with a nice buck he took at 440 yards, with his .257 Weatherby.



Whether professional marksman, dedicated competitive shooter, or avid hunter and outdoorsman, it takes time over your barrel and behind your optics to be successful at long range. There are no shortcuts.

This real-time field shot was textbook, in terms of the setup and execution. Everything in the plan fit toward the successful event. The bottom line in long range shooting as applied to hunting is to know your rifle and cartridge like the back of your hand. Be able to measure exact range to the target, understand wind and how those conditions can change the shooting game a great deal, and last of all practice practice, practice. While good long range shot can be that from birth, most of them are self made with hard work.

Rifles need not be expensive, but must be accurate. Shoot enough cartridge so as to meet the needs in terms of ballistics down range, and remember what you can't see you can't hit. Scopes are critical, and buy quality systems with secondary mil dots or moa reticules. Review the section on optics in this book. Everything there has been taken afield and hands on tested on real time targets at some point or another. No desk top reviews here I am here to say.

CONCLUSION

The subject of long-range shooting is a complicated one, to be sure. I have tried to cover it in terms that apply to many levels of the shooting sports, versus narrowing the subject down for a chosen few who shoot long range targets for a living or who shoot at distance competitively. I sincerely hope that no matter what kind of rifleman you are, you've found something of value here.

As I travel to different range operations or page through shooting publications that keep track of both competitive shooting scores and ultra-

long-range kills on warm targets, I see a continual advancement of names on the lists of successful 500-, 600-, 1,000-, and even 2,000-yard shooters. I believe this is because today's long-range shooting equipment is very good and shooters use that equipment with skill and take their craft seriously.

Shooting at long range is an art and, as you have seen in the preceding pages, approaches to the practice and the tools the trade are almost infinite in their variety. A workable approach for one shooter may not even be considered by another—but that's just fine! For the most part, the greatest element the shooter has on their side when taking up long-range shooting with a high-power rifle is themselves. *Never* sell yourself short, because, in almost all cases, each individual has the inner tools to do the job. You just need to awaken those tools and set them in motion.

From the rimfire rifle shooter who is stretching shots to 100 yards, to the professional, heavy-caliber military sniper pushing for 1,000-yard hits on material or other military related targets, the game is the same. Get the most out of the gun you're shooting and learn it well, in terms of your ability to send bullets downrange accurately.

If you're just getting started, you don't need all the equipment in the world in order to judge range and dope a bullet's flight to the target. Start simple and learn well the basics well. Stick with that game plan and you're going to become a good long-range shot.

Keep in mind that a rifle that is accurate is far better than a rifle that is great looking but won't group bullets. Ammunition that is made with care and knowledge will always perform better for the long-range rifleman than will bargain-basement loads you found on some unknown clearance table.

Finally, when you have tested yourself at a given range and are doing well, push a bit and try for that next level. *Always* try to do better at your craft. Above all, play the game with integrity. Don't push bullets to wild

ranges on game animals, and always be sure of where those long-range bullets are going with a known and safe backstop behind their eventual end. Follow these simple rules, and the rest of this story will take care of itself.



ABOUT THE AUTHOR

L.P. Brezny has worked in the test and development end of smoothbore and rifle shooting sports for better then 50 years. In that time, he has developed new load designs that are currently in use by the shooting sports industry, including loads ranging from subsonic deer to winged target ammunition, and he has made contributions to both large and small companies in terms of their load development projects.

Prior to his long career as a firearms writer and ammunition developer, the author was a street police officer for 23 years via the S.F.P.D. in the Minneapolis/Saint Paul metro area. Eventually ranking as a sergeant, he worked as a training officer with young rookies and spent a great deal of time teaching the use of the shotgun and rifle as combat tools on the street. Also, as a high-school teacher of 36 years, Brezy ran hunter education and shooting programs directly through the Minneapolis Public Schools during a time when shooting was still an accepted primary and secondary school subject, and he's logged an additional 17 years working in other youth shooting training programs.

Today, L.P. lives in the Black Hills of South Dakota, among the rocks, tress, and native wildlife. A "back 40" test range occupies most of his days, giving way to writing projects on subjects that are just about endless.



ACKNOWLEDGEMENTS

The following companies and individuals have made it possible to gain access to the many varied products and services needed to bring this book of long-range shooting together. Many thanks for all their efforts. Spur Outfitters, Barnes Bullets, guide Douglas T. Wadsworth, Ross Metzger/SHOTdata Systems, RCBS, Western Powders, Inc., Hodgdon Powder Co., Inc., CCI Ammunition, Speer Bullets, Nosler, Inc., Winchester/Olin Corp., Redding Reloading Equipment, Sierra Bullets, Hornady Manufacturing, Federal Premium Ammunition/ATK, Browning Arms Company, Battenfeld Technologies, Pentax, Berger Bullets, Kimber America, Savage Arms Company, Beretta USA, Sturm, Ruger & Company, Inc., Remington Arms Company, LLC, Cabela's, Inc., Burnham Brothers, guide Cory Lundberg, Elk Mountain Hotel, Foxpro, Inc., Warne Scope Mounts, MTM Case-Gard, H-S Precision, Ballistic Research & Development, CR-10, Black Hills Ammunition, Leupold & Stevens, Inc., Hunter's Specialties, Wolf Performance Ammunition, Olympic Optical, Howard Communications, Swarovski Optik, EnvironMetal, Inc., Bushnell Corporation, Trijicon, Inc., Rifles, Inc., Accuracy International, Tac Pro Shooting Center, Rod Herret Gun Stocks, Carl Zeiss AG, Steiner Optics, Century International Arms, Inc., Timney Triggers, Smith & Wesson, O.F. Mossberg & Sons, ArmaLite, Inc., Weatherby, Inc., Sisk Rifles, the Greg Iverson Ranch of Tilford, South Dakota, Scott Withy, Hyperfire Gun Shop of Queensland, Australia, Jack First Gunsmiths, Tom Hanson, and Jerome Besler. Thank you one and all.

Copyright ©2014 F+W Media, Inc.

All rights reserved. No portion of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopy, recording, or any information storage and retrieval system, without permission in writing from the publisher, except by a reviewer who may quote brief passages in a critical article or review to be printed in a magazine or newspaper, or electronically transmitted on radio, television, or the Internet.

Published by



Gun Digest® Books, an imprint of F+W Media, Inc.
Krause Publications • 700 East State Street • Iola, WI 54990-0001
715-445-2214 • 888-457-2873
www.krausebooks.com

To order books or other products call toll-free 1-800-258-0929
or visit us online at www.gundigeststore.com

Cover photography by Corey Graff and Jim Schlender
Back cover photography by Kris Kandler

ISBN-13: 978-1-4402-3946-5
ISBN-10: 1-4402-3946-0

Edited by Jennifer L.S. Pearsall
Designed by Dane Royer

Printed in U.S.A.

RANGE (Yards)	VELOCITY (fps)	WIND DRIFT IN INCHES. (10 mph Crosswind)	MID-RANGE TRAJECTORY (Inches)	
			100 Yd. Zero	200 Yd. Zero
0	2600	0	—	—
100	2410	0.7	Zero	-plus2.3
200	2230	3.2	-4.4	Zero
300	2060	7.6	-15.8	-9.3
400	1890	13.9	—	-25.9
500	1730	22.9	—	-52.1

[Return to main text](#)

RANGE (Yards)	VELOCITY (fps)	WIND DRIFT IN INCHES. (10 mph Crosswind)	MID-RANGE TRAJECTORY (Inches)	
			100 Yd. Zero	200 Yd. Zero
0	3140	0	—	—
100	2910	0.6	Zero	—
200	2700	2.6	-2.6	Zero
300	2470	6.2	-10.0	-6.1
400	2250	11.3	—	-17.7
500	2120	18.6	—	-36.0

[Return to main text](#)

RANGE (Yards)	VELOCITY (fps)	WIND DRIFT IN INCHES. (10 mph Crosswind)	MID-RANGE TRAJECTORY (Inches)	
			100 Yd. Zero	200 Yd. Zero
0	3350	0	”	”
100	3230	0.7	Zero	”
200	2930	3.0	-1.8	Zero
300	2640	7.2	-7.8	-6.8
400	2380	13.3	”	-17.5
500	2130	22.0	”	-35.8

[Return to main text](#)

TESTED: KIMBER PRO-VARMINT IN 204 RUGER				
Muzzle	100 yards	200 yards	300 yards	400 yards
-1.5	0	-6.7	-24.0	-55.5
Velocity (fps)				
Muzzle	100 yards	200 yards	300 yards	400 yards
2,350	2,070	1,810	1,574	1,369
Energy (ft-lbs)				
Muzzle	100 yards	200 yards	300 yards	400 yards
1,349	1,046	800	606	N/A

[Return to main text](#)

Bullet	Powder wt/grains	MV (fps)	Group 3&5 shot	Note
Varmint				
Sierra Blitzking 55 gr.	Ramshot Hunter 45.3	3526	.345 (3)	Good Accuracy Load
Sierra 60 gr. JHP Varminter	Ramshot Hunter 46.5	3629	.378 (3)	Wind
Hornady 55 gr. V-Max	Ramshot hunter 46.7	3748	1.006 (3)	
Prairie Dogs/General				
Sierra 55 gr. Blitzking	Hodgdon Varget 40.5	3836	1.036	
Hornady 55 gr. V-Max	Hodgdon Varget 40.5	3827	.199	
Winchester 55 gr. BST	Factory		3787	.339
Sierra 55 gr. Blitzking	Ramshot Hunter 46.0	n/a	.242	Accuracy load
Hornady 55 gr. V-Max	Ramshot Hunter 46.0	n/a	.371 (3)	Accuracy load
Deer				
Sierra spitzer 65 gr. BT	Ramshot Hunter 45.0	3475	1.03	
Speer 55 gr. Trophy	Ramshot Hunter 46.0	3500	1.050	
Bonded Bear Claw				
Hornady 60 gr. SP	Ramshot Hunter 46.0	3514	1.00	

[Return to main text](#)

Load	Bullet/Powder	OAL (")	MV (fps)	Pressure (psi)	Group (") @ 100 Yds.
1	Hornady V-Max 32 gr./Varget 27.0 gr.	2250	3557	38300	.535
2	Berger H.P. 35 gr./Varget 29.0 gr.	2254	3812	53100	.275
3	Hornady V-Max 40 gr./Varget 28.0 gr.	2.290	3647	55100	1.122
4	Berger H.P. 50 gr./Varget 26.0 gr.	2.300	3311	55200	.236
5	Hornady V-Max 32 gr./H335 28.3 gr.	2250	4123	54800	.299
6	Sierra Blitzking 32 gr./H335 28.3 gr.	2270	4044	N/A	255
7	Berger H.P. 35 gr./H335 27.5	2230	3915	56600	.398
8	V-Max 40 gr./H335 26.8 gr.	2250	3738	56700	1.133

[Return to main text](#)

Load	Bullet/Powder	OAL (")	MV (fps)	Pressure (psi)	Group (") @ 100 Yds.
9	Hornady 32 gr. V-Max/IMR 30-31 25.0 gr.	2.240	3602	44.400	.884
10	Hornady 32 gr. V-Max/IMR 30-31 26.1 gr.	2.240	3793	52.800	.805
11	Hornady 40 gr. V-Max/IMR 30-31 25.6 gr.	2250	3694	56000	255*
12	Berger 50 gr./IMR 30-31 24 gr.	2.300	3284	55100	Key
13	Sierra Blitzking/32 gr. IMR 30-31 26.2 gr.	2250	3900	N/A	.275*
14	Sierra Blitzking 39 gr./IMR 30-31 25.3 gr.	2250	3600	N/A	.621
15	Sierra Blitzking 32 gr./X-Terminator 27.0 gr.	2250	4200	N/A	.276*
16	Hornady V-Max 40 gr./X-Terminator 25.0 gr.	2250	3800	N/A	.450
17	Sierra Blitzking 32 gr./TAC 29.0 gr.	2250	4100- plus**	N/A	.496
18	Hornady 32 gr. V-Max/TAC 29.0 gr.	2250	4100- plus**	N/A	.280*
19	Berger 30 gr./TAC 29.0 gr.	2250	4100- plus**	N/A	.780
20	Sierra Blitzking 32 gr./Accurate 2015 26.0 gr.	2.285	3696	N/A	.370*
21	Hornady V-Max 32 gr./Accurate 2015 26.0 gr.	2.285	3684	N/A	.679
22	Berger 30 gr./Accurate 2015 26.0 gr.	2.239	3714	N/A	.346*
23	Hornady V-Max 40 gr./Accurate 2015 25.5 gr.	2.285	3627	N/A	.772
24	Berger 35 gr./Accurate 2015 25.5 gr.	2.240	3686	N/A	.186*
25	Berger 30 gr./X-Terminator 25.0 gr.	2250	3748	N/A	.864
26	Berger 30 gr./X-Terminator 27.0 gr.	2250	3972	N/A	1.124
27	Berger 35 gr./W748 29.5 gr.	2.230	3875	55700	.279*
28	Berger 30 gr./W748 29.5 gr.	2229	3913	N/A	.313*
29	Hornady V-Max 32 gr./W748 29.5 gr.	2.290	4094	N/A	.281*

30	Berger 50 gr./W748 29.5 gr.***	2.240	2978	N/A	.327
31	Berger 40 gr./X-Terminator 25.0 gr.	2250	3872	N/A	.311*

[Return to main text](#)

RANGE (Yards)	IMPACT (inches)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)	30 MPH-LEAD (Feet)
0	-2.0	0.0	3295	0.0000	3617.1	0.0	0.0
100	26.4	0.6	3054	0.0946	3106.5	-1.7	4.2
200	51.1	2.6	2825	0.1967	2659.1	-7.1	8.7
300	71.3	6.0	2608	0.3073	2266.3	-16.9	13.5
400	86.5	11.1	2401	0.4271	1921.1	-31.8	18.8
500	95.6	18.0	2204	0.5576	1618.2	-52.8	24.5
600	97.6	27.0	2016	0.6999	1353.8	-81.0	30.8
700	91.0	38.4	1838	0.8558	1125.3	-118.0	37.7
800	74.0	52.6	1671	1.0270	930.2	-165.5	45.2
900	44.6	69.7	1517	1.2155	766.6	-226.1	53.5
1000	-0.0	90.2	1378	1.4232	632.6	-302.6	62.6
1100	-62.9	114.4	1257	1.6513	526.5	-398.7	72.7
1200	-147.9	142.2	1157	1.9004	446.3	-518.5	83.6
1300	-258.8	173.5	1080	2.1693	388.5	-665.7	95.4
1400	-399.5	207.8	1020	2.4556	346.8	-843.2	108.0
1500	-573.7	244.9	973	2.7574	315.2	-1053.2	121.3

[Return to main text](#)

Powder Load	Case	Primer	MV (fps)	Pressure (ft-lbs)	Bullet	Group
Varget 41.0 grains	Federal	Federal LR	3,474	Book 54.500	70-grain Nosler BT	.884
IMR 3031 38.0 grains	Federal	Federal LR	3,428	Book 53.100	70-grain Nosler BT	1.046
	Federal	Factory	N/A		70-grain Nosler BT	.782
	Federal	Factory	N/A		85-grain Barnes TS	1.022
Varget 44.0 grains	Winchester	Winchester LR	3,739	Book 52,000	58-grain Hornady V-Max	.992
Varget 47.0 grains	Winchester	Winchester LR	3,975	Book 62.800	58-grain Hornady V-Max	1.028
Varget 40.0 grains	Winchester	Winchester LR	3,671	Book 45.400	60-grain Sierra HPBT	.769
IMR 3031 37.0 grains	Winchester	Winchester LR	3,520	Book 38.300	55-grain Nosler BT	.599

[Return to main text](#)

RANGE (Yards)	VEL (fps)	ENERGY (ft-lbs)	Momentum (Lb-Sec)	DROP (inches)
0	2910.0	12,163.5	8.36	0
50	2839.5	11,580.9	8.16	-0.52
100	2770.1	11,021.7	7.96	-2.12
150	2701.7	10,484.8	7.76	-4.85
200	2634.5	9,969.2	7.57	-8.77
250	2568.2	9,474.1	7.38	-13.95
300	2503.0	8,998.7	7.19	-20.44
350	2438.5	8,541.5	7.01	-28.32
400	2375.1	8,102.7	6.82	-37.66
450	2312.6	7,681.9	6.64	-48.54
500	2251.0	7,278.2	6.47	-61.04
550	2190.3	6,891.0	6.29	-75.26
600	2130.5	6,520.0	6.12	-91.29
650	2071.7	6,164.8	5.95	-109.24
700	2013.8	5,825.2	5.79	-129.21
750	1956.9	5,500.6	5.62	-151.32
800	1901.0	5,190.9	5.46	-175.71
850	1846.1	4,895.5	5.30	-202.5
900	1792.3	4,614.4	5.15	-231.84
950	1739.7	4,347.3	5.00	-263.88
1000	1688.2	4093.9	4.85	-298.8

[Return to main text](#)

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)
0	-2.0	0.0	2,846	0.0000	11,639.4	0.0
50	1.3	0.1	2,780	0.0533	11,102.1	-0.5
100	3.5	0.4	2,714	0.1079	10,585.3	-2.2
150	4.6	1.0	2,650	0.1639	10,088.1	-5.1
200	4.4	1.8	2,586	0.2212	9,609.8	-9.1
250	2.9	2.9	2,523	0.2799	9,149.5	-14.5
300	0.0	4.2	2,461	0.3401	8,706.7	-21.3
350	-4.3	5.8	2,401	0.4018	8,280.9	-29.5
400	-10.1	7.6	2,340	0.4651	7,871.4	-39.2
450	-17.5	9.8	2,281	0.5300	7,477.8	-50.5
500	-26.6	12.2	2,223	0.5966	7,099.5	-63.4
550	-37.4	15.0	2,165	0.6650	6,736.3	-78.1
600	-50.1	18.1	2,108	0.7352	6,387.6	-94.7
650	-64.7	21.5	2,052	0.8073	6,053.3	-113.2
700	-81.4	25.3	1,997	0.8814	5,733.1	-133.9
750	-100.3	29.4	1,943	0.9576	5,426.6	-156.7
800	-121.5	33.9	1,890	1.0358	5,133.6	-181.8
850	-145.1	38.8	1,838	1.1163	4,853.7	-209.4
900	-171.3	44.1	1,787	1.1991	4,586.8	-239.6
950	-200.2	49.8	1,736	1.2843	4,332.7	-272.5
1000	-232.0	55.9	1687	1.3719	4091.0	-308.4

[Return to main text](#)

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)
0	-2.0	0.0	2,910	0.0000	12,168.8	0.0
50	1.2	0.1	2,839	0.0522	11,586.0	-0.5
100	3.4	0.5	2,770	0.1057	11,026.5	-2.1
150	4.4	1.0	2,702	0.1605	10,489.7	-4.9
200	4.2	1.9	2634	0.2167	9973.4	-8.8
250	2.8	2.9	2,568	0.2744	9,477.9	-13.9
300	0.0	4.3	2,503	0.3336	9,002.0	-20.4
350	-4.1	5.9	2,439	0.3943	8,545.0	-28.3
400	-9.7	7.8	2,375	0.4566	8,106.3	-37.7
450	-16.9	10.0	2,313	0.5206	7,685.3	-48.5
500	-25.6	12.5	2,251	0.5864	7,281.5	-61.1
550	-36.1	15.3	2,190	0.6539	6,894.2	-75.3
600	-48.4	18.4	2,131	0.7233	6,523.1	-91.3
650	-62.6	21.9	2,072	0.7947	6,167.8	-109.3
700	-78.9	25.8	2,014	0.8682	5,828.0	-129.3
750	-97.2	30.0	1,957	0.9437	5,503.4	-151.5
800	-117.9	34.6	1,901	1.0215	5,193.5	-175.9
850	-140.9	39.7	1,846	1.1016	4,898.2	-202.8
900	-166.5	45.1	1,792	1.1841	4,617.1	-232.3
950	-194.8	51.0	1,740	1.2690	4,349.9	-264.5
1000	-226.0	57.3	1688	1.3565	4096.4	-299.7

[Return to main text](#)

0	-2.0	0.0	2,846	0.0000	11,639.4	0.0
50	1.5	0.2	2,753	0.0536	10,893.4	-0.5
100	3.8	0.6	2,662	0.1090	10,187.0	-2.2
150	4.9	1.4	2,574	0.1663	9,517.4	-5.2
200	4.7	2.6	2,486	0.2256	8,883.2	-9.4
250	3.1	4.1	2,401	0.2870	8,282.5	-15.0
300	-0.0	6.0	2,317	0.3506	7,713.9	-22.2
350	-4.7	8.4	2,235	0.4165	7,176.0	-31.0
400	-11.2	11.1	2,154	0.4849	6,667.5	-41.5
450	-19.6	14.3	2,075	0.5558	6,187.6	-53.9
500	-29.9	18.0	1,998	0.6295	5,735.5	-68.3
550	-42.5	22.2	1,922	0.7061	5,310.2	-84.9
600	-57.4	27.0	1,849	0.7856	4,911.1	-103.9
650	-74.8	32.2	1777	0.8684	4537.5	-125.4
700	-95.0	38.1	1,707	0.9545	4,188.6	-149.8
750	-118.2	44.6	1,640	1.0442	3,864.0	-177.2
800	-144.6	51.8	1,575	1.1375	3,563.0	-207.9
850	-174.5	59.6	1,512	1.2348	3,285.1	-242.3
900	-208.2	68.2	1,452	1.3360	3,029.5	-280.6
950	-246.1	77.5	1,395	1.4415	2,795.8	-323.1
1000	-288.4	87.5	1341	1.5512	2583.4	-370.4

[Return to main text](#)

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)
0	-2.0	0.0	3,250	.0000	9,383.9	0.0
50	0.7	0.1	3,157	0.0468	8,851.8	-0.4
100	2.5	0.5	3,065	0.0951	8,346.3	-1.7
150	3.4	1.1	2,976	0.1447	7,865.8	-3.9
200	3.3	2.0	2,888	0.1959	7,409.0	-7.1
250	2.2	3.1	2,802	0.2486	6,974.5	-11.4
300	-0.0	4.6	2,718	0.3030	6,561.2	-16.7
350	-3.4	6.3	2,635	0.3591	6,167.9	-23.2
400	-8.1	8.4	2,554	0.4169	5,793.6	-31.0
450	-14.1	10.8	2,474	0.4766	5,437.4	-40.1
500	-21.5	13.5	2,396	0.5382	5,098.5	-50.7
550	-30.4	16.6	2,319	0.6018	4,776.3	-62.7
600	-40.9	20.0	2,243	0.6676	4,470.1	-76.4
650	-53.2	23.9	2,169	0.7356	4,179.3	-91.8
700	-67.3	28.1	2,096	0.8060	3,903.4	-109.1
750	-83.4	32.8	2,025	0.8788	3,642.1	-128.4
800	-101.6	38.0	1,955	0.9542	3,394.9	-149.8
850	-122.1	43.6	1,886	1.0323	3,161.5	-173.6
900	-145.0	49.7	1,820	1.1133	2,941.5	-199.8
950	-170.6	56.4	1,754	1.1972	2,734.7	-228.8
1000	-199.0	63.6	1691	1.2843	2540.6	-260.6
0	-2.0	0.0	3,250	0.0000	9,383.9	0.0
50	0.6	0.1	3,196	0.0465	9,072.5	-0.4
100	2.3	0.3	3,142	0.0939	8,770.2	-1.7
150	3.1	0.6	3,089	0.1420	8,476.7	-3.8
200	3.0	1.1	3,037	0.1910	8,191.8	-6.9
250	2.0	1.8	2,985	0.2408	7,915.1	-10.9
300	0.0	2.6	2,934	0.2915	7,646.4	-15.9
350	-3.0	3.5	2,883	0.3431	7,385.4	-21.8
400	-7.1	4.6	2,833	0.3956	7,131.9	-28.9
450	-12.2	5.9	2,784	0.4490	6,885.6	-37.0

500	-18.5	7.4	2,735	0.5034	6,646.3	-46.2
550	-25.9	9.0	2,687	0.5587	6,413.8	-56.6
600	-34.5	10.8	2,639	0.6150	6,187.9	-68.2
650	-44.4	12.7	2,592	0.6724	5,968.4	-81.1
700	-55.5	14.9	2,545	0.7308	5,755.0	-95.2
750	-68.0	17.2	2,499	0.7903	5,547.7	-110.7
800	-81.9	19.8	2,453	0.8508	5,346.4	-127.6
850	-97.3	22.5	2,408	0.9126	5,150.7	-145.9
900	-114.1	25.5	2,363	0.9754	4,960.7	-165.7
950	-132.5	28.6	2,319	1.0395	4,776.1	-187.1
1000	-152.5	32.0	2275	1.1049	4596.9	-210.1

[Return to main text](#)

RANGE (Yards)	Velocity (Ft/Sec)	Drop (inches)
0	2,950	-1.5
50	2,904	-0.5
100	2,859	-2.04
150	2,814	-4.64
200	2,770	-8.33
250	2,726	-13.15
300	2,683	-19.15
350	2,640	-26.35
400	2,598	-34.79
450	2,556	-44.53
500	2,514.6	-55.59
550	2,473	-68.02
600	2,432	-81.88
650	2,391	-97.21
700	2,351	-114.05
750	2,311	-132.47
800	2,272	-152.51
850	2,233	-174.23
900	2,194	-197.7
950	2,163	-222.97
1000	2,118	-250.1
1050	2081	-279.18

[Return to main text](#)

RANGE (Yards)	Velocity (Ft/Sec)	Drop (inches)
0	2,910	-1.5
50	2,839	-0.52
100	2,770	-2.12
150	2,701	-4.85
200	2,634	-8.77
250	2,568	-13.95
300	2,503	-20.44
350	2,438	-28.32
400	2,375	-37.66
450	2,312	-48.54
500	2,251	-61.04
550	2,190	-75.26
600	2,130	-91.29
650	2,071	-109.24
700	2,013	-129.21
750	1,956	-151.32
800	1,901	-175.71
850	1,846	-202.5
900	1,792	-231.84
950	1,739	-263.88
1000	1688	-298.8

[Return to main text](#)

Factory Load/ Handload	Bullet/Load	Muzzle Velocity (fps)	Group (") (3-Shot@100 Yards)
Factory	Winchester 40-grain JHP	4,000	.542
Factory	Winchester Super X 55-grain Pointed Soft Point	3,680	.486
Factory	Winchester USA Brand 45-grain Jacketed HP	4,000	.620
Handload	Sierra Blitz King 55-grain/38.0 gr Hunter*	3,361	.470
Handload	Hornady V-MAX 55-grain/38.0 Hunter*	3,327**	.381
Handload	Barnes VLC 50-grain/40.7 Hunter*	3,546	.455
Factory	Federal Premium Nosler BT 55-grain	4,150	.532
Factory	Federal Premium Sierra Game King BTHP 55-grain	3,680	.388
Handload	Trophy Bonded Bear Claw 55-grain/ 39.5 Hunter*	3,478	.444

[Return to main text](#)

Cartridge	Bullet	MV (fps)	Target Vel (fps)	Target Range (Yds.)	% Vel. Retained At Target
.22-250 Rem.	40-gr. Fed.	3894	2070	300	53%
.223 Rem.	40-gr. Fed	3676	2212	200	60%
.22-250 Rem.	40-gr. Nosler	3667	2162	300	59%
.22-250 Rem.	50-gr. Nosler	3700	2471	300	67%
.223 Rem.	50-gr. Speer	3171	2199	200	69%
.223 Rem.	50-gr. Speer	3251	2258	200	69%
.22-250 Rem.	51.3-gr. Calhoon	3671	2241	300	61%
.22-250 Rem.	51.3-gr. Calhoon	3582	2325	300	65%
.22-250 Rem.	Rem 52-gr. Win EXP	3652	2276	300	62%
.223 Rem.	55-gr. Berger	3139	2241	200	71%
.22-250 Rem.	55-gr. Berger	3527	2401	300	68%
.22-250 Rem.	55-gr. Fed BT	3611	2374	300	66%
.22-250 Rem.	55-gr. Hornady FM	3286	2284	300	70%
.22-250 Rem.	55-gr. Hornady SX	3353	2150	300	64%
.22-250 Rem.	55-gr. Nosler	3503	2481	300	71%
.223 Rem.	55-gr. Nosler	3170	2311	200	73%
.22-250 Rem.	55-gr. Win SP	3365	2162	300	64%
.25-06 Rem.	87-gr. Berger	3360	2289	400	68%
.25-06 Rem.	87-gr. Berger FB	3361	2503	300	74%
.25-06 Rem.	87-gr. Sierra FB	3416	2135	400	63%
.25-06 Rem.	87-gr. Sierra FB	3415	2437	300	71%
.25-06 Rem.	87-gr. Speer TNT	3263	2431	300	75%
.25-06 Rem.	100-gr. Speer BT	3330	2550	300	77%
.25-06 Rem.	100-gr. Speer BT	3320	2364	400	71%

[Return to main text](#)

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)
0	-1.5	0.0	3200	0.0000	3820.9	0.0
50	0.8	0.1	3087	0.0477	3556.8	-0.4
100	2.1	0.6	2978	0.0972	3308.6	-1.8
150	2.5	1.4	2871	0.1485	3075.2	-4.1
200	1.8	2.5	2766	0.2017	2855.7	-7.5
250	-0.0	4.0	2665	0.2570	2649.1	-12.0
300	-3.0	5.8	2565	0.3144	2454.7	-17.7
350	-7.4	8.1	2467	0.3740	2271.7	-24.8
400	-13.2	10.7	2372	0.4360	2099.5	-33.3
450	-20.5	13.8	2279	0.5005	1937.7	-43.4
500	-29.5	17.4	2188	0.5677	1785.6	-55.1
550	-40.4	21.5	2098	0.6377	1643.0	-68.6
600	-53.2	26.1	2011	0.7107	1509.5	-84.2
650	-68.1	31.2	1926	0.7869	1384.8	-101.9
700	-85.4	37.0	1844	0.8665	1268.7	-122.0
750	-105.2	43.4	1764	0.9497	1160.9	-144.8
800	-127.9	50.5	1686	1.0367	1061.1	-170.4
850	-153.6	58.2	1612	1.1277	969.2	-199.2
900	-182.6	66.7	1540	1.2229	884.8	-231.5
950	-215.3	76.0	1471	1.3226	807.9	-267.6
1000	-252.1	86.1	1407	1.4269	738.2	-307.9

[Return to main text](#)

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)
0	-1.5	0.0	2712	0.0000	2744.4	0.0
50	1.6	0.2	2611	0.0564	2544.4	-0.6
100	3.4	0.8	2513	0.1149	2356.1	-2.5
150	3.8	1.7	2416	0.1758	2178.9	-5.7
200	2.7	3.1	2322	0.2391	2012.3	-10.5
250	0.0	5.0	2230	0.3050	1855.7	-16.8
300	-4.4	7.4	2140	0.3737	1708.7	-25.0
350	-10.8	10.2	2052	0.4453	1570.9	-35.0
400	-19.2	13.6	1966	0.5200	1442.2	-47.0
450	-29.8	17.6	1882	0.5979	1322.1	-61.4
500	-42.9	22.2	1801	0.6794	1210.4	-78.2
550	-58.7	27.5	1722	0.7646	1106.9	-97.7
600	-77.4	33.4	1646	0.8537	1011.3	-120.2
650	-99.3	40.1	1573	0.9469	923.5	-146.0
700	-124.8	47.5	1503	1.0445	843.1	-175.4
750	-154.1	55.8	1437	1.1466	770.0	-208.7
800	-187.6	64.8	1374	1.2534	704.1	-246.4
850	-225.7	74.8	1315	1.3651	644.9	-288.9
900	-268.8	85.5	1260	1.4817	592.5	-336.7
950	-317.4	97.2	1210	1.6032	546.4	-390.2
1000	-372.0	109.7	1165	1.7296	506.5	-449.9

[Return to main text](#)

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)
0	-1.5	0.0	3048	0.0000	3095.1	0.0
50	1.0	0.2	2926	0.0502	2852.0	-0.5
100	2.5	0.7	2807	0.1026	2625.0	-2.0
150	2.9	1.7	2691	0.1571	2413.2	-4.6
200	2.1	3.0	2579	0.2141	2215.3	-8.4
250	0.0	4.8	2469	0.2735	2030.5	-13.5
300	-3.5	7.1	2362	0.3357	1857.9	-20.0
350	-8.6	9.9	2257	0.4006	1697.0	-28.1
400	-15.4	13.2	2155	0.4687	1547.0	-37.9
450	-24.1	17.1	2055	0.5399	1407.6	-49.6
500	-34.8	21.6	1959	0.6147	1278.3	-63.4
550	-47.8	26.7	1865	0.6932	1158.8	-79.5
600	-63.3	32.6	1774	0.7756	1048.8	-98.1
650	-81.6	39.2	1687	0.8624	947.9	-119.5
700	-102.9	46.6	1603	0.9536	856.0	-144.1
750	-127.6	54.8	1523	1.0496	772.6	-172.2
800	-156.1	63.9	1447	1.1507	697.5	-204.2
850	-188.7	74.0	1376	1.2571	630.5	-240.6
900	-225.9	85.0	1309	1.3689	571.2	-281.8
950	-268.2	97.0	1249	1.4862	519.5	-328.4
1000	-316.0	110.0	1194	1.6092	475.0	-381.0

[Return to main text](#)

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)
0	-1.5	0.0	3270	0.0000	3087.4	0.0
50	0.7	0.2	3139	0.0468	2845.7	-0.4
100	2.1	0.7	3013	0.0956	2620.7	-1.7
150	2.4	1.6	2890	0.1464	2411.1	-4.0
200	1.8	2.8	2770	0.1994	2215.6	-7.3
250	-0.0	4.5	2654	0.2548	2033.3	-11.7
300	-3.0	6.6	2540	0.3126	1863.1	-17.4
350	-7.4	9.1	2430	0.3729	1704.4	-24.4
400	-13.2	12.2	2322	0.4361	1556.4	-32.9
450	-20.7	15.7	2216	0.5022	1418.5	-43.0
500	-29.9	19.9	2114	0.5715	1290.3	-54.9
550	-41.1	24.6	2014	0.6442	1171.4	-68.8
600	-54.4	29.9	1917	0.7205	1061.4	-84.8
650	-70.1	36.0	1823	0.8008	960.0	-103.3
700	-88.4	42.8	1733	0.8852	866.9	-124.4
750	-109.6	50.3	1646	0.9740	781.9	-148.6
800	-134.0	58.7	1562	1.0676	704.7	-176.1
850	-162.0	68.0	1483	1.1662	635.1	-207.3
900	-193.9	78.2	1408	1.2700	572.8	-242.7
950	-230.2	89.4	1339	1.3793	517.5	-282.8
1000	-271.4	101.5	1275	1.4941	469.1	-328.1
0	-1.5	0.0	3356	0.0000	2751.6	0.0
50	0.7	0.2	3202	0.0458	2505.2	-0.4
100	2.0	0.8	3054	0.0937	2278.5	-1.6
150	2.4	1.8	2911	0.1440	2069.6	-3.8
200	1.8	3.2	2772	0.1969	1877.0	-7.0
250	0.0	5.1	2637	0.2523	1699.3	-11.4
300	-3.0	7.5	2507	0.3107	1535.3	-17.0
350	-7.4	10.4	2380	0.3721	1383.9	-23.9
400	-13.3	13.9	2257	0.4368	1244.4	-32.4
450	-21.0	18.1	2137	0.5051	1116.1	-42.7

500	-30.5	22.9	2021	0.5773	998.3	-54.9
550	-42.2	28.5	1909	0.6536	890.7	-69.2
600	-56.3	34.9	1801	0.7345	792.8	-86.0
650	-73.0	42.1	1698	0.8203	704.2	-105.5
700	-92.8	50.3	1599	0.9114	624.7	-128.2
750	-115.9	59.4	1506	1.0081	553.8	-154.5
800	-142.9	69.6	1418	1.1108	491.3	-184.8
850	-174.2	80.9	1337	1.2197	436.8	-219.7
900	-210.4	93.4	1264	1.3352	390.1	-259.9
950	-252.1	107.0	1198	1.4572	350.7	-305.9
1000	-299.8	121.7	1141	1.5856	318.3	-358.4

[Return to main text](#)

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)	30MPH-LEAD (Feet)
0	-1.5	0.0	3526	0.0000	1656.8	0.0	0.0
50	0.8	0.3	3256	0.0443	1413.0	-0.4	1.9
100	2.2	1.3	3003	0.0923	1201.7	-1.6	4.1
150	2.7	2.9	2764	0.1443	1018.0	-3.7	6.4
200	2.0	5.4	2537	0.2010	857.8	-7.0	8.8
250	0.0	8.8	2321	0.2628	718.1	-11.7	11.6
300	-3.6	13.2	2116	0.3305	596.8	-18.0	14.5
350	-9.2	18.8	1922	0.4048	492.2	-26.2	17.8
400	-17.2	25.8	1739	0.4869	403.1	-36.9	21.4
450	-28.0	34.3	1570	0.5777	328.6	-50.6	25.4
500	-42.3	44.5	1417	0.6783	267.7	-68.1	29.8
550	-61.0	56.6	1284	0.7896	219.6	-90.2	34.7
600	-85.0	70.7	1173	0.9120	183.4	-118.0	40.1
650	-115.3	86.6	1087	1.0451	157.6	-152.6	46.0
700	-153.0	104.2	1023	1.1875	139.4	-194.7	52.3
750	-198.9	123.2	972	1.3382	125.8	-244.8	58.9
800	-254.0	143.5	929	1.4962	115.1	-303.6	65.8
850	-319.3	165.1	892	1.6611	106.1	-371.6	73.1
900	-395.4	187.8	859	1.8326	98.4	-449.3	80.6
950	-483.4	211.6	829	2.0106	91.6	-537.6	88.5
1000	-584.0	236.6	801	2.1951	85.5	-637.2	96.6

[Return to main text](#)

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)
0	-1.5	0.0	3347	0.0000	2164.6	0.0
50	0.8	0.2	3164	0.0461	1934.8	-0.4
100	2.2	0.9	2989	0.0949	1726.7	-1.7
150	2.6	2.1	2821	0.1465	1537.9	-3.9
200	1.9	3.9	2659	0.2013	1366.5	-7.3
250	-0.0	6.2	2503	0.2594	1210.6	-11.8
300	-3.3	9.2	2352	0.3213	1069.1	-17.8
350	-8.2	12.9	2206	0.3871	940.8	-25.3
400	-14.8	17.4	2066	0.4574	824.7	-34.7
450	-23.5	22.7	1931	0.5325	720.3	-46.1
500	-34.5	29.0	1801	0.6129	626.9	-59.9
550	-48.2	36.3	1678	0.6992	544.1	-76.5
600	-65.0	44.7	1562	0.7919	471.4	-96.3
650	-85.4	54.4	1454	0.8915	408.3	-119.8
700	-109.9	65.3	1354	0.9984	354.5	-147.8
750	-139.1	77.6	1265	1.1130	309.5	-180.8
800	-173.8	91.2	1188	1.2355	272.7	-219.6
850	-214.6	106.2	1123	1.3655	243.7	-265.1
900	-262.3	122.5	1070	1.5025	221.1	-317.7
950	-317.6	139.8	1026	1.6459	203.3	-378.0
1000	-381.2	158.2	989	1.7950	188.9	-446.4

[Return to main text](#)

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)	30MPH-LEAD (Feet)
0	-1.5	0.0	3580	0.0000	1565.6	0.0	0.0
50	0.2	0.3	3349	0.0433	1369.8	-0.4	1.9
100	1.0	1.0	3130	0.0897	1196.4	-1.5	3.9
150	1.0	2.4	2921	0.1393	1042.5	-3.5	6.1
200	0.0	4.4	2723	0.1925	905.5	-6.5	8.5
250	-2.2	7.1	2533	0.2496	783.5	-10.8	11.0
300	-5.8	10.5	2350	0.3111	674.8	-16.3	13.7
350	-10.9	14.8	2176	0.3774	578.2 -	23.5	16.6
400	-17.9	20.1	2008	0.4492	492.7	-32.5	19.8
450	-27.0	26.4	1849	0.5270	417.6	-43.8	23.2
500	-38.7	33.9	1699	0.6117	352.4	-57.7	26.9
550	-53.4	42.8	1558	0.7039	296.6	-74.8	31.0
600	-71.7	53.1	1429	0.8045	249.5	-95.6	35.4

[Return to main text](#)

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)
0	-1.5	0.0	3630	0.0000	1521.9	0.0
50	0.1	0.2	3407	0.0427	1340.6	-0.3
100	1.0	1.0	3195	0.0881	1179.2	-1.4
150	1.0	2.2	2994	0.1366	1035.3	-3.4
200	-0.0	4.1	2802	0.1884	906.5	-6.3
250	-2.1	6.5	2617	0.2438	791.2	-10.3
300	-5.4	9.7	2441	0.3032	687.9	-15.6
350	-10.2	13.7	2271	0.3669	595.4	-22.4
400	-16.7	18.5	2107	0.4355	512.9	-30.9
450	-25.2	24.2	1951	0.5094	439.6	-41.4
500	-35.9	31.0	1802	0.5895	375.1	-54.2
550	-49.4	39.0	1661	0.6762	318.8	-69.9
600	-65.9	48.3	1530	0.7703	270.5	-88.8

[Return to main text](#)

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)
0	-1.5	0.0	3242	0.0000	1167.2	0.0
50	0.5	0.3	3017	0.0480	1010.9	-0.4
100	1.5	1.2	2803	0.0995	872.8	-1.8
150	1.4	2.9	2600	0.1551	750.6	-4.3
200	-0.0	5.3	2405	0.2151	642.3	-8.1
250	-2.9	8.6	2219	0.2800	546.7	-13.4
300	-7.5	12.8	2041	0.3505	462.4	-20.5
350	-14.3	18.2	1871	0.4273	388.9	-29.7
400	-23.5	24.8	1712	0.5111	325.3	-41.4
450	-35.8	32.8	1563	0.6029	271.3	-56.3
500	-51.5	42.4	1427	0.7034	226.1	-74.8
550	-71.6	53.6	1306	0.8133	189.4	-98.0
600	-96.8	66.5	1203	0.9331	160.6	-126.5

[Return to main text](#)

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)
0	-1.5	0.0	3703	0.0000	1675.0	0.0
50	0.0	0.2	3483	0.0418	1481.9	-0.3
100	0.9	0.9	3274	0.0862	1309.5	-1.4
150	0.9	2.1	3075	0.1335	1155.3	-3.2
200	-0.0	3.8	2885	0.1838	1017.0	-6.0
250	-1.9	6.2	2703	0.2375	892.8	-9.8
300	-5.1	9.1	2529	0.2949	781.2	-14.9
350	-9.6	12.8	2361	0.3563	680.8	-21.2
400	-15.6	17.3	2199	0.4221	590.7	-29.2
450	-23.5	22.6	2044	0.4929	510.1	-39.0
500	-33.4	28.9	1895	0.5691	438.6	-51.0
550	-45.8	36.2	1753	0.6514	375.6	-65.4
600	-61.0	44.8	1620	0.7405	320.6	-82.8

[Return to main text](#)

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)
0	-1.5	0.0	3550	0.0000	2099.3	0.0
50	0.5	0.2	3385	0.0433	1908.8	-0.4
100	1.7	0.7	3227	0.0887	1734.2	-1.5
150	2.1	1.7	3074	0.1363	1573.9	-3.4
200	1.6	3.0	2926	0.1863	1426.5	-6.3
250	-0.0	4.9	2784	0.2389	1290.9	-10.2
300	-2.7	7.1	2646	0.2941	1166.1	-15.2
350	-6.6	10.0	2512	0.3523	1051.1	-21.4
400	-11.9	13.3	2382	0.4136	945.1	-29.1
450	-18.7	17.3	2256	0.4784	847.7	-38.3
500	-27.2	21.9	2133	0.5467	758.2	-49.2
550	-37.7	27.2	2015	0.6191	676.3	-62.0
600	-50.3	33.2	1900	0.6957	601.6	-77.1
650	-65.3	40.1	1790	0.7771	533.8	-94.6
700	-83.0	47.9	1685	0.8635	472.7	-115.0
750	-103.8	56.6	1584	0.9553	418.1	-138.5
800	-128.0	66.3	1489	1.0530	369.6	-165.8

[Return to main text](#)

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)
0	-1.5	0.0	2991	0.0000	3338.1	0.0
50	1.1	0.2	2884	0.0511	3103.0	-0.5
100	2.6	0.7	2779	0.1041	2881.8	-2.0
150	3.0	1.5	2677	0.1591	2673.7	-4.7
200	2.1	2.7	2577	0.2162	2477.8	-8.6
250	0.0	4.4	2479	0.2755	2293.5	-13.8
300	-3.5	6.4	2384	0.3372	2120.0	-20.4
350	-8.6	8.9	2290	0.4014	1956.9	-28.5
400	-15.4	11.8	2199	0.4683	1803.7	-38.3
450	-23.9	15.2	2109	0.5379	1659.9	-49.9
500	-34.4	19.2	2022	0.6106	1525.3	-63.5
550	-47.0	23.7	1937	0.6864	1399.6	-79.2
600	-61.9	28.8	1854	0.7655	1282.5	-97.3
650	-79.4	34.6	1774	0.8483	1173.6	-117.9
700	-99.6	41.0	1696	0.9348	1072.9	-141.4
750	-122.9	48.1	1621	1.0253	980.0	-167.9
800	-149.4	55.9	1549	1.1200	894.8	-197.9
850	-179.6	64.5	1480	1.2191	817.0	-231.7
900	-213.8	73.9	1414	1.3228	746.4	-269.6
950	-252.3	84.2	1353	1.4313	682.8	-312.1
1000	-295.5	95.3	1295	1.5447	626.0	-359.6

[Return to main text](#)

RANGE (Yards)	IMPACT (Los-in)	DEFL. (inches)	VEL (fps)	TIME (Seconds)	ENERGY (ft-lbs)	DROP (inches)
0	-1.5	0.0	3601	0.0000	1152.0	0.0
50	0.1	0.2	3401	0.0429	1027.9	-0.3
100	0.9	0.9	3211	0.0883	916.1	-1.4
150	0.9	2.0	3029	0.1364	815.2	-3.4
200	0.0	3.7	2855	0.1874	724.0	-6.3
250	-2.0	5.9	2687	0.2415	641.4	-10.2
300	-5.2	8.7	2525	0.2991	566.5	-15.4
350	-9.8	12.1	2369	0.3604	498.7	-22.0
400	-15.9	16.3	2219	0.4259	437.4	-30.1
450	-23.8	21.3	2074	0.4958	382.1	-39.9
500	-33.8	27.1	1934	0.5707	332.4	-51.9

[Return to main text](#)

RANGE (Yards)	VEL (fps)	ENERGY (ft-lbs)	Impact inches (250-Yd. Zero)
0	3600	1583	-1.5
50	3412	1422	0.5
100	3232	1276	1.7
150	3060	1143	2.1
200	2894	1023	1.6
250	2735	913	0.0
300	2581	813	-2.7
350	2432	722	-6.5
400	2288	639	-12.3

Title	Date	Distance	Weapon	Nationality/Military Unit	Conflict
Corporal of Horse (CoH) Craig Harrison	Nov. 2009	2,475 meters (2,707 yards)	Accuracy International L115A3	United Kingdom, Household Cavalry Life Guards	War in Afghanistan
Corporal Rob Furlong	Mar. 2002	2,430 meters (2,657 yards)	McMillan Tac-50	Canada, 3rd Battalion, Princess Patricia's Canadian Light Infantry	War in Afghanistan
Master Corporal Arron Perry	Mar. 2002	2,310 meters (2,526 yards)	McMillan Tac-50	Canada, 3rd Battalion, Princess Patricia's Canadian Light Infantry	War in Afghanistan
Sergeant Brian Kremer	Mar. 2004	2,300 meters (2,515 yards)	Barrett M82A1	United States Army, 2nd Ranger Battalion	Iraq War
Gunnery Sergeant Carlos Hathcock	Feb. 1967	2,286 meters (2,500 yards)	M2 Browning machine gun	United States Marine Corps	Vietnam War
Unknown South African Special Forces sniper	Aug. 2013	2,125 meters (2,324 yards)	Denel NTW-20	South African Special Forces Brigade	United Nations Organization Stabilization Mission in the Democratic Republic of the Congo
Nicholas Ranstad	Jan. 2008	2,092 meters (2,288 yards)	Barrett M82A1	United States Army, 1-91 Cavalry/173rd ABCT	War in Afghanistan
Chief Petty Officer Chris Kyle	Aug. 2008	1,920 meters (2,100 yards)	McMillan Tac-338	United States Navy, S.E.A.L. Team 3, Charlie	Iraq War - Sadr City
Corporal Christopher Reynolds	Aug. 2009	1,853 meters (2,026 yards)	Accuracy International L115A3	United Kingdom, 3 Scots, The Black Watch	War in Afghanistan
Billy Dixon	Jun. 1874	1,406 meters	Sharps .50-90	United States (civilian buffalo hunter)	American Indian Wars

		(1,538 yards)			
Unknown Norwegian sniper	Nov. 2007	1,380 meters (1,509 yards)	Barrett M82A1	Norway, Norwegian Army 2nd Battalion	War in Afghanistan
Staff Sergeant Jim Gilliland [A3]	Sep. 27, 2005	1,250 meters (1,367 yards)	M24 rifle	United States Army, 2nd Battalion, 69th Armored Regiment, 3rd Infantry Division, Sniper Shadow Team	Iraq War/Ramadi

[Return to main text](#)